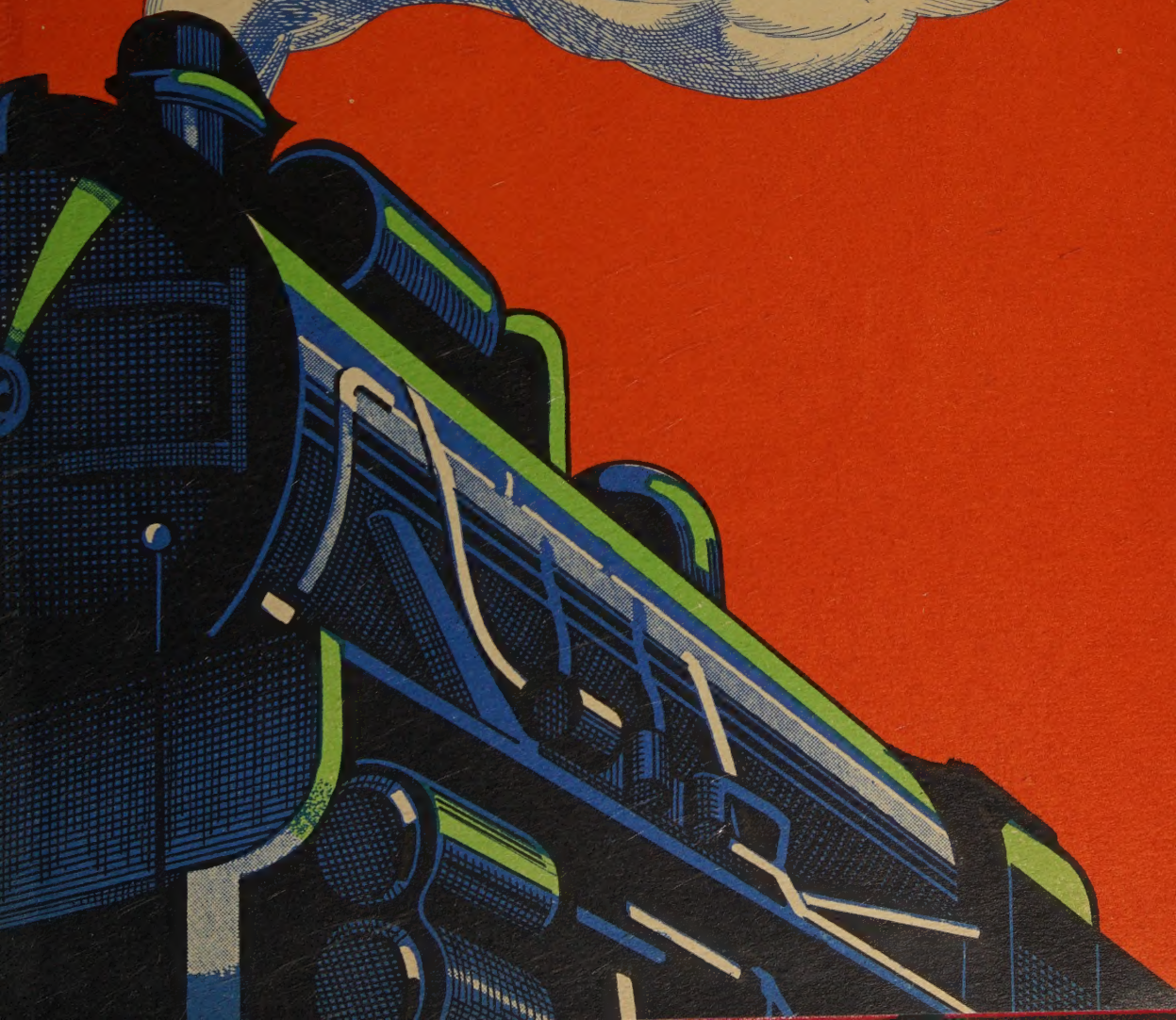
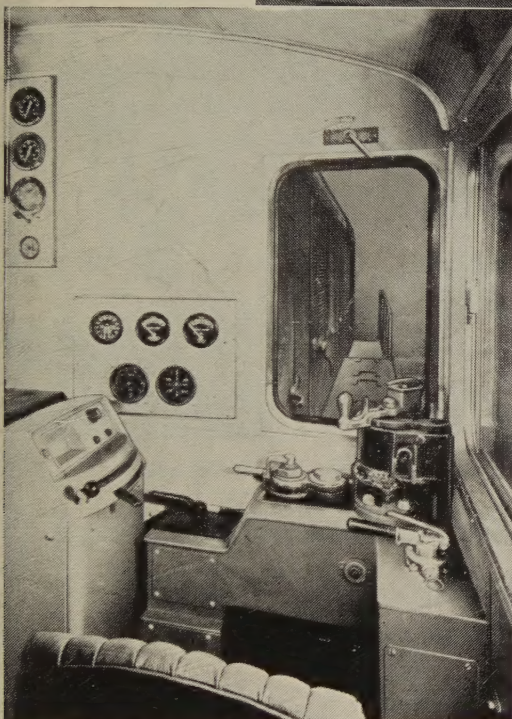


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VOL. XXXVI. — No. 12.

DECEMBER 1959.

Monthly
Bulletin
of the International
Railway Congress Association
(English Edition)





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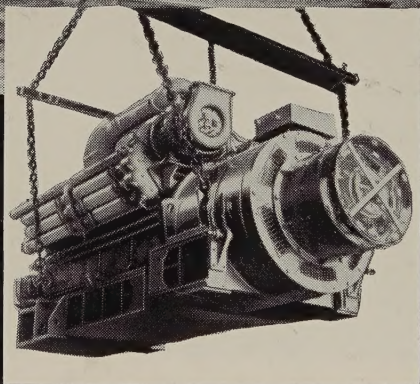
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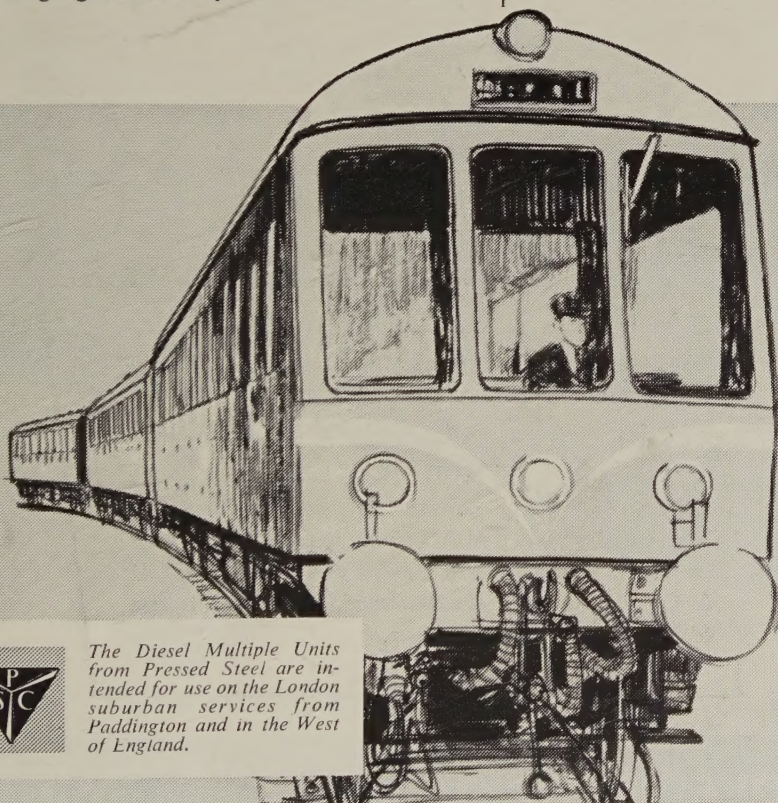
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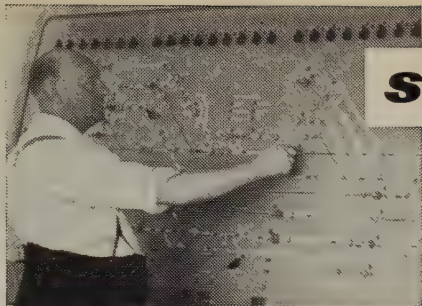
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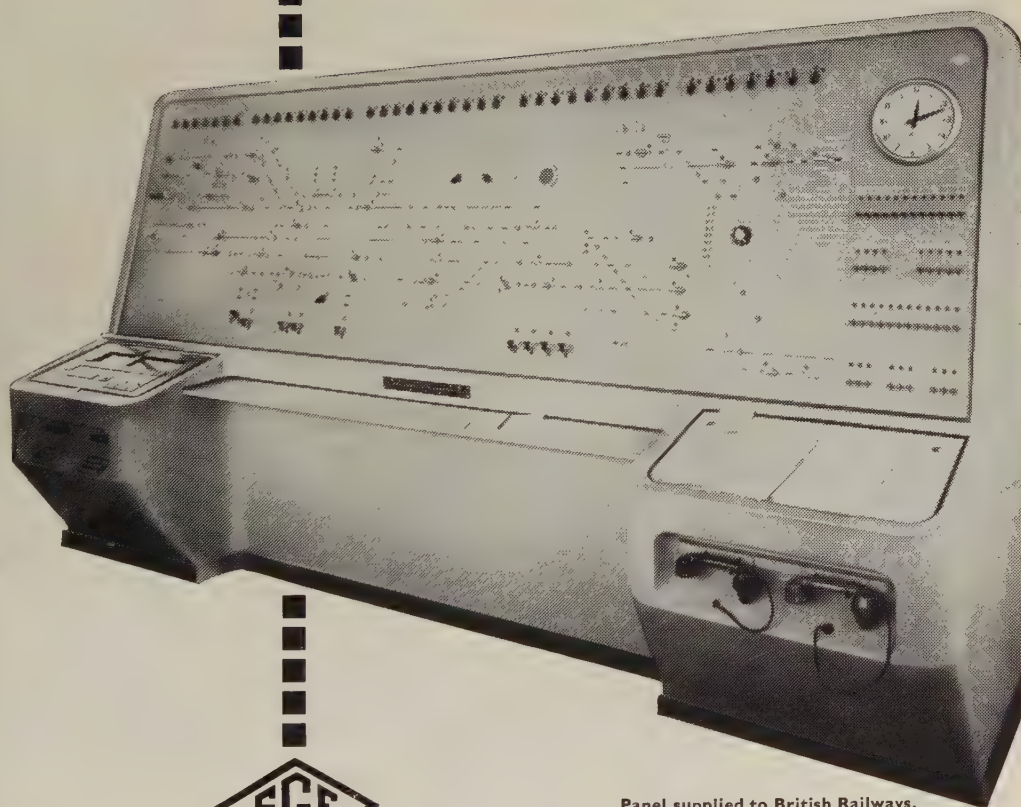
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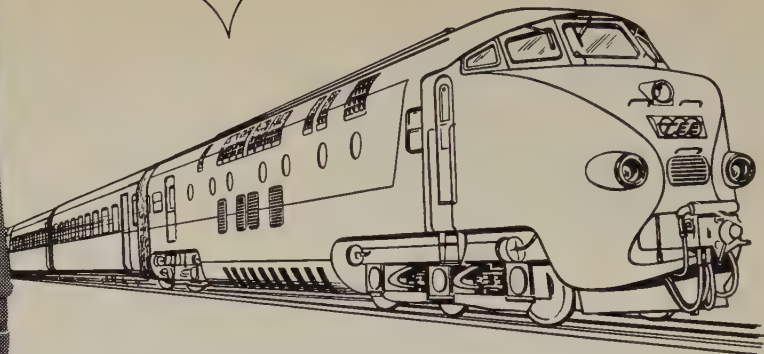
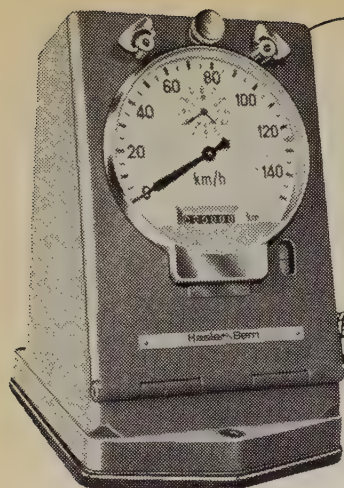
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An edition in French is also published.

BULLETIN
OF THE
INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

[385 (06 .112)

SEVENTEENTH SESSION

Madrid : 29th September to 7th October 1958.

GENERAL PROCEEDINGS

Section V : LIGHT RAILWAYS AND COLONIAL RAILWAYS.

INAUGURAL MEETING

September 30, 1958, at 9.30 a. m.

PRESIDENT : DR. ING. V. PERRONE.

INSPECTEUR GÉNÉRAL SUPÉRIEUR HONORAIRE DU MINISTÈRE DES TRANSPORTS D'ITALIE,
MEMBER OF THE PERMANENT COMMISSION OF THE ASSOCIATION.

— The meeting opened at 9.30 a.m.

The President (in French). — Gentlemen, the Permanent Commission has asked me to preside over the work of Section V. First of all, I wish to welcome all the Delegates present, and to thank you in advance for the way you are going to follow the discussions. I also wish to thank the Reporters for our Section for undertaking such an arduous task as the preparation of their reports.

I have pleasure in advising you that the Permanent Commission has suggested the following names in view of constituting the Bureau of the Section, as *Vice-Presidents* :

Mr. R. HOENS, General Manager of the Belgian National Light Railways Company, member of the Permanent Commission of the Association;

Mr. T.C. COURTNEY, Member of the Córás Iompair Eireann, member of the

Permanent Commission of the Association and as *Principal Secretary* :

Mr. D.H.C. DU PLESSIS, General Manager of the South African Railways and Harbours;

Mr. J. ŠVAGEL, Engineer, Manager of the Railway Institute of the General Management of the Yugoslavian Railways, member of the Permanent Commission of the Association,

Mr. R. DE CLERCQ, General Inspector of the Belgian National Light Railways Company.

— *The Section signified its approval.*

— The Section, at the suggestion of the PRESIDENT, then elected the remaining officials and drew up its agenda.

QUESTION 9.

Experience obtained concerning the undulatory wear of rails.

- **Damaging effects on track, bridges, viaducts and tunnels, and on the rolling stock.**
- **Research into the causes of this kind of wear.**
- **Measures taken to avoid or to remedy it.**

Preliminary documents.

Report (America [North and South], Australia [Commonwealth of], Burma, Ceylon, Egypt, India, Irak, Iran, Republic of Ireland, Japan, Malaysia, New Zealand, Norway, Pakistan, South Africa, Sudan, Sweden and the United Kingdom of Great Britain and Northern Ireland and dependent overseas territories), by N.C. VOGAN. (See *Bulletin* for May 1958, p. 747.)

Report (Austria, Belgium and Belgian Congo, Bulgaria, Cambodia, Czechoslovakia, Denmark, Ethiopia, Finland, France

and French Union, Western Germany, Greece, Hungary, Indonesia, Italy, Lebanon, Luxemburg, Netherlands, Poland, Portugal and overseas territories, Rumania, Siam, Spain, Switzerland, Syria, Turkey, Union of Soviet Socialist Republics, Vietnam and Yugoslavia), by LUIS PRIETO. (See *Bulletin* for June 1958, p. 963.)

Addendum to Report, by L. PRIETO. (See *Bulletin* for August 1958, p. 1303.)

Special Report, by L. PRIETO. (See *Bulletin* for September 1958, p. 1430.)

DISCUSSION BY THE SECTION.

Meeting of the 30th September 1958.

PRESIDENT : Dr. Ing. V. PERRONE.

— The meeting started at 9.45 a.m.

The President (in French). — Gentlemen, the first item on our agenda is to examine Question 9 which deals with « Experience obtained concerning the undulatory wear of rails. »

Will Mr. PRIETO, *Special Reporter*, please read the Summaries of his report, which I found very much to the point.

Mr. Prieto, *Special Reporter*, read all the Summaries for Question 9.

The President (in French). — Do any Delegates wish to make any comments of a general nature? (*No such comment was made*). Therefore we will go on to examine separately each of these summaries. Will the Principal Secretary please read the text suggested by the Special Reporter for the summaries relating to *Chapter I: Types and characteristics of undulatory wear of rails*.

Mr. De Clercq, *Principal Secretary* (in French). — *Summary No. 1*:

1. The different types of undulatory wear can be classified into two groups:

- a) short wave undulatory wear, the length of wave being 0.03 to 0.08 m (1.181 to 3.149 in.) (most frequently 0.043 m = 1.692 in.), and the depth 0.12 mm (0.00472 in.) (maximum of 0.4 mm = 0.01574 in.);
- b) long wave undulatory wear, with which the length of wave varies between 0.10 and 2 m (3.937 in. and 6 ft. 6 3/4 in.), the depth being 5 mm (0.196 in.) and over.

Mr. Kumar, *Indian Government Railways*. — The only comment I have to make is that the pitch or the length of the wave is quite often less than 3 in., at least as observed in India. I am wondering whether we should not modify to this extent, that the lower limit of the pitch of the short wave undulatory wear, should be reduced to 0.02 instead of 0.03 m.

Mr. De Clercq (in French). — I am sure you understand Mr. KUMAR's comment. He asks that we delete 0.03 and say 0.02. Are you agreed about this limitation?

Mr. Kumar. — I am in agreement with this, but we should not give the

wave length to three decimal places as that sort of accuracy cannot be achieved. It should be only to one decimal place of an inch.

The President (in French). — We will take it to two decimals.

Mr. Feyrabend, *French National Railways* (in French). — The Special Reporter has said that 43 mm is the most usual length. I would like to know what bases he has taken for this figure. It does not correspond to our observations. Our wave lengths are about 3 cm rather than 43 mm.

Mr. Prieto (in French). — This figure was based on the replies received to the questionnaire; all the replies agreed about this estimate.

Mr. Feyrabend (in French). — Is this an average figure based on your calculations?

Mr. Prieto (in French). — No, it is not an arithmetical average. But the figure of 0.043 was reported by several Administrations as the most frequent value of the wave length.

Mr. Feyrabend (in French). — Thank you.

The President (in French). — We can therefore consider Summary No. 1 as adopted with the amendment proposed by Mr. KUMAR.

— *The text of Summary No. 1 will be as follows:*

« 1. The different types of undulatory wear can be classified into two groups :

« (a) short wave undulatory wear, the length of wave being 0.02 to 0.08 m (0.8 to 3.1 in.) (most frequently 0.043 m = 1.7 in.) and the depth 0.12 mm (0.005 in.) (maximum of 0.4 mm = 0.02 in.).

« (b) long wave undulatory wear, with which the length of wave varies between 0.10 and 2 m (3.9 in. and 6 ft. 7 in.), the depth being 5 mm (0.2 in.) and over. »

Mr. De Clercq (in French). — *Summary No. 2 :*

2. The commencement and development of undulatory wear are extremely complex phenomena which it is very difficult to explain completely.

The factors which can have an influence upon undulatory wear are essentially :

- a) the material and method of fabrication of the rails;
- b) rail-wheel pressure;
- c) vibrations of the rail;
- d) reactions of the rail-wheel system under the influence of the rolling stock;
- e) oxydation due to friction;
- f) the rolling stock;
- g) the profile of the lines;
- h) the kind of traffic;
- i) method of laying.

The President (in French). — Any comments ?

Mr. Kumar. — I have a few comments to make, first with regard to the wording of the summary and secondly with regard to some of the technical aspects in it. First, I will deal with the technical aspects. The item « (b), rail-wheel pressure », is exactly the same as item « (d), reactions of the rail-wheel system under the influence of the rolling stock », so one of them

should be deleted because they are exactly the same. In regard to (e), I think the spelling « oxydation » should be corrected to « oxidation ». Item (i), the method of laying, is mentioned here as having an influence on the undulatory wear, but further on the next page under Summary No. 20 it says that the method of laying has very little effect on the development of undulatory wear. There is thus a contradiction. As the method of laying has apparently no effect, it cannot be an essential factor affecting undulatory wear, and, therefore, it should be deleted.

Now I will come to the wording. It is put down : « The commencement and development of undulatory wear are extremely complex phenomena which it is very difficult to explain completely ». The word « development » includes all stages, including the commencement, and therefore there is no point in including the word « commencement ». I would simply say : « The development of undulatory wear is an extremely complex phenomenon ». Or it should be : « The development of undulatory wear is an extremely complex phenomenon which it is difficult to explain completely ».

The President (in French). — Has anyone anything to say about Mr. KUMAR's observations ?

One of his observations concerns the suppression of the word « commencement » because in his opinion the « development » of undulatory wear covers the whole of the process.

Mr. Prieto (in French). — Agreed.

Mr. De Clercq (in French). — As far as I am concerned, I think there is a

difference between commencement, the undulatory wear starting, and its development. These are two clearly different things, because it can commence without developing any further, but I cannot see it developing without starting.

Mr. Kumar. — Well, there is a difference of view. I include in « development » the beginning, the end, everything — development is something which proceeds from the stage of zero onward. It is something which is continuous right from the beginning to the end in a logical sequence. However, this is a matter of opinion.

Mr. De Clercq. — Yes, but first of all you have zero and then the development.

Mr. Kumar. — But the English word « development » includes that. However, that is a matter of opinion. I am not particular if the word « commencement » is retained.

Mr. Hoens, Belgian National Light Railways, Vice-President (in French). — I think it would be better to leave « commencement », otherwise it is not possible to make any distinction between the initial phase and its development. These are two different things.

Mr. Feyrabend (in French). — I agree with the VICE-PRESIDENT, as the causes of its starting and the causes of its developing are completely different.

Its start is a phenomenon which may well be quite definite, and it is advantageous to retain the two phases in the life of undulatory wear in the report.

Mr. Prieto (in French). — I think that the start may be due to very different causes to the development, and it is better to speak of the commencement and of the development, as there may be differences, and this is a clearer definition.

The President (in French). — I see that the comments on this point do not agree with Mr. KUMAR. Are you agreed that we retain « the commencement and development » ? (*Agreed.*)

Then what about Mr. KUMAR's comment on points (b) and (d), which seem to him to be similar and therefore one of these points should be suppressed.

Mr. Prieto (in French). — I think these two points might be summed up in one.

The President (in French). — How would you sum up these two points ?

Mr. Feyrabend (in French). — Again, I think these are two quite different things.

Mr. Kumar. — I would like to retain (d) because it explains a little more in detail the reactions of the rail-wheel system under the influence of the rolling stock. I suppose it would be better to retain this wording and then item (b) can be deleted and the other items renumbered.

The President (in French). — Mr. KUMAR suggests retaining (d) rather than (b).

Mr. Feyrabend (in French). — Are they to be put together ? If they are both put in the same paragraph, I agree; but both of them must be mentioned.

The President (in French). — Do you agree about this new wording : « rail-wheel pressure and the reactions of the rail-wheel system together with the influence of the rolling stock » ?

Mr. Kumar. — The rail-wheel « pressure » results from the actions and reactions of the rail-wheel contact. It is no use inserting item (b) if item (d) is included as they mean the same thing.

Mr. De Clercq (in French). — I think that a distinction should be made between « dynamic » and « static ». These are two different matters.

Mr. Kumar. — Whether there is a dynamic effect or not, a pressure will be there and you can call that reaction or you can call it pressure. The pressure is the resultant of both longitudinal, vertical and lateral forces.

Mr. De Clercq (in French). — We cannot go wrong in being precise.

Mr. Kumar. — But there is no real difference between them, it is the same thing.

The President (in French). — If we are going to be academic, there is no distinction, but if we are to make a distinction between the two, perhaps it would be better to say it all the same. The main thing is to know the objective we are aiming at.

Mr. Oquiñena, Ministry of Public Works, Spain (in French). — It does not seem useful to me to discuss the dynamic

or static point of view. What we are concerned with, is the dynamic effect upon the rails, as the static effects are practically negligible. If we are discussing the wear of the rails, it would be better to speak of the dynamic effects. These are definitely bound up with the pressure.

Mr. Feyrabend (in French). — Excuse me, but the word « static » has permanent effects.

Mr. Oquiñena (in French). — That is different.

Mr. Feyrabend (in French). — Agreed.

Mr. Oquiñena (in French). — In the case of a bridge, for example, there are always dynamic effects and static effects which, after a certain time, have permanent effects. But the dynamic effects are much more important than the static effects.

Mr. Prieto (in French). — Comparing point (b) rail-wheel pressure and (d) reactions of the rail-wheel system... and point (f) the rolling stock; in point (d) we might suppress « the influence of the rolling stock » since this is included in point (f), and put points (b) and (d) together, suppressing « pressure » and simply saying « the reactions of the rail-wheel system ». We would therefore suppress « under the influence of the rolling stock ».

Mr. Broca, Secretary (in French). — But these are different matters : point (d) is concerned with the influence of the rolling stock upon the rail-wheel reactions and point (f) the influence of the

rolling stock in general (factors of Summary No. 14).

Mr. Prieto (in French). — In point (f), there are factors which are not in point (d).

Mr. Kumar. — What is now the proposition under discussion ?

The President (in French). — Points (b) and (d) are put together in a single text : « rail-wheel pressure and the reactions of the rail-wheel system together with the influence of the rolling stock ».

Mr. Ivanov, *U.S.S.R., Railway Transport Ministry* (in Russian). — I am in complete agreement with the Reporter concerning the influence of the rail-wheel pressure on undulatory wear. In addition, I would like to make known the result of our observations in Russia, especially in the case of long welded rails. Owing to the stresses due to the wheels in movement and in particular the horizontal stresses upon the rails and owing to the cant of the rails, there is a tendency for the rails to turn over towards the inside of the track. This occurs most often with high speed electric locomotives.

The President (in French). — I thank Mr. IVANOV for his comments, and as you see these confirm the text.

Mr. Kumar. — Yes, but that has nothing to do with the subject under discussion.

Mr. Ivanov (in Russian). — It was simply an additional comment. I am not asking for it to be included in the summary.

The President (in French). — In this case, we can go on to Mr. KUMAR's third observation.

Mr. Broca (in French). — Mr. KUMAR points out that point (i) « method of laying » would appear to contradict Summary No. 20 in which it is stated : « the method of laying has very little effect upon undulatory wear ». He suggests suppressing it.

Mr. Prieto (in French). — I agree that the method of laying has very little effect, but it was included as a factor since it has some relation to it. But if you think it is of too little importance, we can suppress it.

The President (in French). — In Summary No. 2 it says : « the factors which can have an influence upon undulatory wear are essentially... ». This seems to me to make it difficult to say that the method of laying has very little effect... We might say « not too great an effect » to satisfy Mr. KUMAR.

Mr. Hoens (in French). — The influence of the method of laying should be mentioned later on. It has been found that it does not have much influence. I suggest we simply leave out the word « essentially ».

Mr. Kumar. — If you doubt the accuracy of the statement then it cannot come under essential factors. The wording is : « The factors that can have an influence on undulatory wear are *essentially* ». This is not an *essential* factor if it has a negligible effect.

Mr. Prieto (in French). — « Essentially » does not mean « only », but « essentially » means that it is a question of essential factors.

Mr. Feyrabend (in French). — I agree with Mr. HOENS. It is a question of mentioning the things that may cause it and then eliminating them. I agree with Mr. KUMAR on the final point, that the method of laying has very little effect, but its effect has to be analysed.

The President (in French). — Consequently, in Summary No. 2, we must retain point (i) and suppress the word « essentially ».

Mr. Kumar. — I strongly object to the deletion of the word « essentially ». If this is done, then we must include all factors, however of minor importance and since we do not propose to do so it would be better to say what factors have an important effect. I would therefore suggest that the word « essentially » should not be deleted.

On further consideration, I think another important factor which influences undulatory wear, has been left out. It is the rigidity of the bed of the track. It has been shown that the depth of the ballast and the type of sleepers have an important influence. Now, it has been observed that a hard foundation bed favours particularly the formation of undulatory wear. This is marked on the inner rails on a double line track, on the line laid with concrete sleepers, in a track in tunnels where the ballast layer is thin but the subsoil is hard. Thus the Japanese Railways report says that the thicker the

ballast bed the less is the wear than where track rails are embedded in concrete. Now these all point in the same direction — the hardness of the bed of the track and the type of sleepers have an important bearing. The long wave undulatory wear takes place on those lines which run on a hard bed and therefore a hard bed is an important aspect and should be included. We should include the hardness of the bed of the formation as an essential factor. We may delete (i) because it has a negligible effect, as admitted by the Special Reporter, and retain the word « essentially ».

The President (in French). — If I understand it aright, Mr. KUMAR agrees that we should retain the word « essentially ».

Mr. Broca (in French). — He suggests retaining the word « essentially », and suppressing point (i), adding the point « the rigidity of the bed of the track ».

Mr. De Clercq (in French). — In this case, there would be a contradiction. I think it would be better to maintain point (i) and suppress « essentially ».

Mr. Broca (in French). — Yes, it is an important question. « Method of laying » implies the rigidity of the bed.

Mr. Feyrabend (in French). — No, not at all. It means the way the sleepers are laid. These are two completely different things. I think it should be taken out of the report. We are mentioning all the causes which may have an effect. In fact, the method of laying has

no effect, but at least we ought to say that it has been taken into consideration.

Mr. Broca (in French). — The text says : « the factors which can... ».

Mr. Feyrabend (in French). — « can » implies there is some doubt, « essentially » is an affirmation.

Mr. Eydes, *East African Railways and Harbours*. — If the sentence were : « Some of the factors which have an influence on undulatory wear are... », then carry on, cut out the word « essentially » and just put « some of the factors... »

Mr. Kumar. — « Some of the factors which can have an influence are... », but actually the word « chief » before « factors » should be brought in, « some » factors would include less important ones such as the curvature of the track, displacement of the sleepers which have an effect. We should not in any case ignore some of the factors which are important. If you say the « chief » factors, then you can ignore the less important ones, such as the curvature of the track. Therefore, the word « chief » factors or « main » factors should be brought in otherwise even minor factors have to be mentioned. The laying of the rails has been admitted as a negligible one. I would rather include the « curvature of the track » as it has a more significant influence than the « laying of the track ».

One can quibble about words, but the ideas have to remain the same; they do not alter.

Mr. Prieto (in French). — I would suggest including under (i) the method of laying and the rigidity of the bed of the track.

Mr. Kumar. — One is not connected with the other, but the rigidity of the track should be included because it stands by its own rights. The rigidity of the bed of the track is essentially an important factor and therefore should be included as a separate item, not as a part of another. You can't leave out an important item and include an unimportant one. The rigidity of the bed of the track is an important influence and should not be left out. I am not pressing my point but I am just mentioning to you the importance of the rigidity of the bed of the track.

The President (in French). — We suppress point (i) or we replace it by « rigidity of the bed of the track ».

Mr. De Clercq (in French). — These are two very different things. If we suppress the question, we must also suppress the reply.

The President (in French). — I would like to know if Mr. KUMAR would be satisfied if we retained point (i) and added a further point (j), « the rigidity of the bed of the track » ?

Mr. Kumar. — I have no objection if other people think it is all right. The number of items will remain the same because one item has been left out.

The President (in French). — I would suggest that the Meeting now closes the

debate on this Summary, now that the general opinion on the question has been made known. Does everyone agree?

Mr. Kumar. — We have discussed it quite enough. I will agree to anything that the other members now suggest. We keep « essentially » and add an item and delete another.

The President (in French). — We are therefore agreed that point (j) shall be added, the word « essentially » retained and point (i) retained. Does the Meeting agree? (*Agreed.*)

— *Summary No. 2 is adopted in the following form:*

« 2. The commencement and development of undulatory wear are extremely complex phenomena which it is very difficult to explain completely.

« The factors which can have an influence upon undulatory wear are essentially:

« (a) the material and method of fabrication of the rails;

« (b) vibrations of the rail;

« (c) rail-wheel pressure and reactions of the rail-wheel system under the influence of the rolling stock;

« (d) oxidation due to friction;

« (e) the rolling stock;

« (f) the profile of the lines;

« (g) the kind of traffic;

« (h) the method of laying;

« (i) the rigidity of the bed. »

Mr. De Clercq (in French). — *Summary No. 3:*

3. The damage caused by undulatory wear is far from negligible and is worth taking into consideration.

Most of the railways have found that on lines showing serious undulatory wear there is rapid general deterioration of the track, loosening of the rail fastenings, coachscrews and bolts, ovalisation of the coachscrew holes, loosening of the anti-creep devices, disturbance of the bed, sleepers and ballast.

It can definitely be stated that more rapid deterioration of the sleepers has been noted in sections with serious undulatory wear.

Mr. Kumar. — No comments.

The President (in French). — If we are all agreed, Summary No. 3 is adopted in its original form, and we will go on to Summary No. 4. (*Agreed.*)

Mr. De Clercq (in French). — *Summary No. 4:*

4. Again rapid loosening of the assembly of metal bridges has been noted.

Mr. Kumar. — I don't know whether the wording « loosening of the assembly » of metal bridges is appropriate in the English language. I would have said « loosening of rivets ». Probably that is what was intended. In welded structures, the welding may break up. Actually I would prefer the expression « loosening of the rivets or failure of welds ».

The President (in French). — **Mr. Kumar** would like to know if any deterioration has been found in the welded parts of metal bridges?

Mr. Prieto (in French). — No, nothing was reported about welded bridges.

Mr. Kumar. — Then, we are left only with the effects of loosening of rivets and

of bolts. Or we could simply say « loosening of the fastenings in riveted bridges » or « loosening of the rivets or fastenings of bolted bridges has been noted » — that would perhaps be the right wording.

I would amend the wording — « Again, rapid loosening of the bolts and rivets in bolted and riveted bridges has been noted. » It should not be « noted », it should be « noticed » or « observed ». « Again, rapid loosening of the rivets and bolts in riveted and bolted bridges has been observed. » You use bolts and rivets, and they are capable of getting loose.

The President (in French). — « It has been reported on the other hand that the bolts and rivets soon become loose » or « it has been found »... We must be precise and state what has actually been observed. The exact translation of the phrase suggested by Mr. KUMAR is as follows : « Il a été signalé d'autre part, un relâchement rapide des rivets et boulons dans les ponts rivés ou boulonnés ».

Mr. Feyrabend (in French). — « Rapidly » is perhaps a bit exaggerated, a bit too strong.

Mr. Kumar. — Yes, I think the word « rapid » should be omitted.

The President (in French). — « ... loosening of the bolts and rivets of metal bridges. »

Mr. Broca (in French). — If we say « rivets and bolts », it must be a question of metal bridges.

The President (in French). — This is the subject of Summary No. 4.

Mr. Kumar. — It is not necessary to say « metal » bridges or « steel » bridges, but I thought perhaps the Reporter might have a reason for doing so. You cannot think of concrete bridges when we are talking of loosening of rivets. When you say riveted and bolted construction, the word « metal » is unnecessary because after all only metal bridges are either bolted or riveted. If you want to use the word « metal » I don't mind. Or can we say « rivets and bolts in metal bridges ».

The President (in French). — We are therefore agreed. Summary No. 4 is adopted with the modification suggested.

— *The text adopted is as follows :*

« 4. Again, loosening of bolts and rivets in metal bridges has been observed. »

Mr. De Clercq (in French). — *Summary No. 5 :*

5. Research work concerning its effects upon the rolling stock is somewhat inconclusive.

In general, the vibrations set up by undulatory wear have a destructive effect upon the various parts of the rolling stock. But it is extremely difficult to evaluate the total sum of such damage, especially in the case of the rolling stock.

Mr. Kumar. — In this clause there are two aspects which are to be considered. The first is the reference to inconclusive research work. I do not know what reports the Special Reporter had in his mind when he said that researches have not shown any conclusive effect of wear

on the rolling stock. The second part apparently is based on observations on the effect of wear on rolling stock. So there are two different aspects: first, research work; second, actual field observations.

As regards the first, the Special Reporter must have received reports to state that some railways did carry out research work which showed there was no conclusive indication that undulatory wear has an effect on rolling stock. The wording of the first sentence should be like this: « Research work has not shown conclusively that undulatory wear has a destructive effect on the rolling stock », because as it stands now, it has an involved construction. I am putting it in a simple, forthright way. The word « its » before « effects » refers not to the research work but to undulatory wear, so the best way is to say: « Research work has not shown conclusively that undulatory wear has any destructive effect on the rolling stock ».

I would like to know whether there is any report on research work bearing on this point. I read in the report that research work has just started in some countries, but the question is, has it reached a stage when some inferences can be drawn. The Special Reporter should tell us. Has there been any research work from which we can conclude that it has been inconclusive?

Mr. Prieto (in French). — We might delete the first paragraph.

Mr. Kumar. — That will be all right, because the research work has just begun and it is perhaps premature to say it is inconclusive.

Mr. Feyrabend (in French). — Is this paragraph No. 5 devoted solely to the rolling stock or solely to the damage?

Mr. De Clercq (in French). — To the damage. I think the two sentences might be condensed into one. I think we should say: « On the whole the vibrations due to undulatory wear have a harmful effect on the various components of the rolling stock. But it is difficult to estimate the actual damage ».

The President (in French). — Do you agree to this modification?

Mr. Kumar. — « It is difficult to estimate the extent of the damage caused. » That is agreed too.

Mr. Feyrabend (in French). — The « value » rather than the « amount ».

The President (in French). — We have therefore adopted Summary No. 5 in the following form:

« 5. In general, the vibrations set up by undulatory wear have a destructive effect upon the various parts of the rolling stock, but it is difficult to evaluate the extent of the damage caused. »

We now come to *Chapter II: Investigation into the causes of undulatory wear.*

Mr. De Clercq (in French). — *Summary No. 6:*

6. The composition of the metal plays an important part in the formation of undulatory wear. For example, Martin-Siemens rails with a low nitrogen content are generally less subject to short wave undulatory wear than Thomas steel rails, and heat treated rails are more exposed to it than those which have not been so treated.

Mr. Kumar. — I would only suggest the substitution of the word «exposed» by the word «vulnerable», because «exposed» is less appropriate in the present text. The revised draft is : «heat treated rails are more *vulnerable* to it than those which have not been so treated».

Mr. Feyrabend (in French). — There are also rails of Thomas steel with a low nitrogen content. The comparison between Martin and Thomas steel is another matter.

Mr. Kumar. — Yes, now when oxygen blast is used there is little nitrogen in the steel. This happens in the L.D. process of steel manufacture which is being followed in some countries. I agree in principle with the wording. Does anyone propose any change ?

Mr. Feyrabend (in French). — It is possible to make rails of Thomas steel with low nitrogen content. I think we should insist upon the fact that rails with a low nitrogen content are less exposed to undulatory wear, or if you prefer, in the two cases, the rails with a low nitrogen content are the best.

Mr. De Clercq (in French). — Would you agree to this wording : «the composition of the metal plays an important part in undulatory wear. For example, rails with a low nitrogen content are generally less exposed to undulatory wear...»

Mr. Feyrabend (in French). — «Thus for example, rails of Martin-Siemens steel are less exposed. However, a low nitrogen

content improves the way rails manufactured by both processes stand up to it.»

Mr. De Clercq (in French). — Or : «However, a low nitrogen content improves the way rails manufactured by these processes stand up to it». And finally, we must add a final phrase : «Heat treated rails...»

Mr. Feyrabend (in French). — So that we have : «Thus for example, the composition of the metal plays an important part in undulatory wear. Martin-Siemens rails are generally less exposed to short wave undulatory wear than Thomas steel rails. However, a low nitrogen content improves the behaviour of rails manufactured by both methods. Heat treated rails are more vulnerable than those which have not been treated.»

Mr. Kumar. — The Thomas steel rails are generally more liable to undulatory wear because of the high nitrogen content. In rails of which the steel is made with an oxygen blast, there is little nitrogen in it than when an air blast is used. So it is due to the higher nitrogen content that there is more of the undulatory wear in the Thomas steel rails.

I agree with the wording. This wording is, I think, satisfactory, because it brings in the importance of the nitrogen content of the rail steel.

I would say : «For example, Martin-Siemens rails are generally less subject to short wave undulatory wear than Thomas steel rails on account of the low nitrogen content of the steel in the former.»

Mr. Feyrabend (in French). — I think we should make it quite clear that if

Siemens steels are manufactured which give good results, Thomas steel can be made with a low nitrogen content, which gives also satisfactory results. Therefore, I think the two points should be clearly separated in the summary and special mention made of the nitrogen content which makes it possible to improve the types of rails. We should say first of all : « Martin-Siemens gives the best results »; secondly, « a low nitrogen content improves both methods ». As soon as there is a low nitrogen content, the results are good, whatever is the process.

Mr. Kumar. — Well then, the wording should be : « For example, Martin-Siemens rails are generally less subject to short wave undulatory wear than Thomas steel rails, perhaps due to the low nitrogen content of the steel in the former ». If the intention is that there are other factors involved and this is one of them — i.e. low nitrogen is one of them, then we should say something like this : « For example, Martin-Siemens rails are generally less subject to short wave undulatory wear than Thomas steel rails, and *so also* are rails with low nitrogen content. »

We will make a new sentence : « Heat treated rails are more vulnerable to it than those which have not been so treated. »

Mr. Broca (in French). — The text of the Summary would read therefore as follows :

« 6. The composition of the metal plays an important part in the formation of undulatory wear. For example, Martin-Siemens rails are generally less subject to short wave undulatory wear than Thomas steel rails. A low nitrogen

content improves the resistance to wear of rails manufactured by these two processes. Heat treated rails are more vulnerable to it than those which have not been so treated. »

— *Adopted.*

Mr. De Clercq (in French). — *Summary No. 7 :*

7. Rails that have been treated and those that have been straightened upright tend to show more marked undulatory wear.

Mr. Kumar. — I do not know what treatment is referred to — rails that have been treated. Treated with what ? Heat treated ? What treatment is referred to ? We should simply say : « Rails that have been straightened upright tend to show more marked undulatory wear ».

Mr. Prieto (in French). — Delete « treated », and say : « those straightened upright ».

Mr. Broca (in French). — Because the words : « treated rails » are not very precise.

The President (in French). — « Treated rails straightened upright show more marked signs. »

Mr. Kumar. — I would slightly alter the wording. I would say : « Rails that during manufacture have been straightened in an upright position tend to show more marked undulatory wear ».

Mr. Feyrabend (in French). — Agreed and we leave out « treated ».

Mr. Broca (in French). — It was a mere repetition.

— *The text adopted is as follows:*

« 7. Rails which have been straightened upright during manufacture tend to show more marked undulatory wear. »

Mr. De Clercq (in French). — *Summary No. 8:*

8. Although short wave undulatory wear affects rails of all weights (perhaps heavy rails slightly more), long wave undulatory wear occurs the lower the weight, moment of inertia and limit of elasticity.

Mr. Kumar. — I agree with the principle of it or with the idea, but I would like to reword the second part of the sentence: « Although short wave undulatory wear affects rails of all weights (perhaps heavy rails slightly more), etc. »; long wave undulatory wear « occurs » is not appropriate, we should say « long wave undulatory wear is more marked in light rails with reduced moment of inertia and perhaps with reduced elastic properties of the material ».

The President (in French). — Do you agree to Mr. KUMAR's suggestion?

Mr. Broca (in French). — Yes, it is simply a question of the translation.

Mr. R. Lévi, *French National Railways* (in French). — I would like to speak, because I was one of the first to report the existence of long wave undulatory wear more than 20 years ago, and personally, I have never found that there is any correlation between the weight of the rails

and the existence of long wave undulatory wear, and I am wondering whether it is really advisable to deal with this point 8 here, which might lend itself to controversy. I am wondering whether it would not be better to suppress this summary purely and simply.

Mr. Kumar. — It is for the Special Reporter or the other Reporter to tell us what are the effects reported. Has he got enough evidence to come to this inference? If not, we can delete it.

Mr. De Clercq (in French). — Your point, Mr. LÉVI, is that being one of the first to study the relations between undulatory wear and the weight, you consider the affirmations made in point 8 should not be retained but should be suppressed.

Mr. R. Lévi (in French). — Perhaps basically there is a misunderstanding. What we call undulatory wear, is the undulating variation in the height of the rail. Perhaps the representative of the Indian Railways is speaking of deformation of the flange. Undulatory wear is the change in the surface of the head, and this I maintain has nothing to do with the weight of the rail.

Mr. Feyrabend (in French). — There is a very definite distinction between undulatory wear and the complete deformation of the rail; and the fact of complete deformation has been reported to me in the case of light rails. But this is not undulatory wear. It is wear in festoons.

Mr. Kumar. — It is a question of fact and observation. Is it an undulation in

the vertical plane ? Is it a deformation of the whole rail and not of the rail-table ? It is a question of an observed fact; I do not know which is it.

Mr. Prieto (in French). — I think that the observations mentioned in paragraph 8 are very variable. Short wave undulatory wear occurs on all rail profiles. It is observed more frequently on heavy rails, but long wave undulatory wear occurs more frequently on light rails.

Mr. De Clercq (in French). — You disagree with Mr. LÉVI's affirmations. The Reporter's conclusions were based on the general opinion with which Mr. LÉVI seems to disagree, and as a result we must decide whether this point 8 is to be suppressed.

Mr. R. Lévi (in French). — In order not to confound undulatory deformation with wear.

Mr. De Clercq (in French). — Perhaps, the Reporters misinterpreted the matter, or misunderstood the details sent in.

Mr. Kumar. — It is quite possible that the other effect may also be there in lighter rails. It may be that the questionnaire was misunderstood by some of the organizations responding to it and that undulatory wear was assumed to include also the deformation of the track as a whole. That is quite possible. Actually, we have very little trouble with undulatory wear in our country — it is negligible.

Mr. De Clercq (in French). — Perhaps, you might agree part of the sentence,

i.e. « short wave undulatory wear affects rails of all weights ». And then all the rest of the sentence could be suppressed.

Mr. Feyrabend (in French). — The second part of the sentence is a matter for caution.

Mr. R. Lévi (in French). — Unless we say : « short or long wave undulatory wear affects rails of all weights ».

Mr. De Clercq (in French). — Then there is no relation between undulatory wear and the weight of the rails ?

Mr. Feyrabend (in French). — We might say : perhaps heavy rails are slightly more affected » and be content with this.

Mr. Oquiñena (in French). — This is a point which might be referred to a future Congress.

Mr. Broca (in French). — Mr. KUMAR agrees. The text of Summary No. 8 could be reworded as follows :

« 8. Undulatory wear affects rails of all weights. Short wave undulatory wear may perhaps be more apparent with heavy rails. »

— *This text is adopted.*

Mr. De Clercq (in French). — *Summary No. 9 :*

9. In general, welded track shows no difference from the point of view of undulatory wear compared with ordinary non-welded track.

Mr. Kumar. — I would simply say : « In general, the welding of track rails

does not in any way affect the undulatory wear ».

Mr. Feyrabend (in French). — That would have to be translated properly into French.

Mr. Broca (in French). — « Dans l'ensemble, la soudure des rails n'a pas d'effet sur l'usure ondulatoire. »

Mr. Feyrabend (in French). — That perhaps is a little too peremptory since welded rails are really a recent innovation.

Mr. Broca (in French). — « does not appear to have any effect... »

Mr. Feyrabend (in French). — « Undulatory wear is also found, though perhaps to a lesser extent, on welded lengths. »

Mr. Broca (in French). — « On the whole, undulatory wear is also found though perhaps to a lesser degree on welded lengths. »

Mr. Kumar. — If that is the experience then the wording should be : « The welding of the track rail to some extent assists in reducing the undulatory wear ». Then we approach the point directly, that it does assist in the reduction of the undulatory wear. In general, the welding of track rails perhaps — may be, to a small degree — reduces the undulatory wear... The Special Reporter says that it has no effect ?

Mr. Prieto (in French). — The Administrations did not state that there was

appreciably less undulatory wear; — it cannot be defined... Certain Administrations did say that there was more undulatory wear on welded track. It is very difficult to come to a decision in this case.

Mr. Kumar. — There is no difference — we have undulatory wear in welded and non-welded rails, which means that the undulatory wear is as much on non-welded rails as on welded rails — they are equal. First of all, the facts : the Special Reporter says there is no difference. He finds no difference from a large number of reports in the welded rails as compared with non-welded rails. What is the weight of the rails on which he has noticed that there is no difference in the incidence of the undulatory wear ?

Mr. Ivanov (in Russian). — 50 to 65 kg per metre. No appreciable difference has been found.

Mr. Feyrabend (in French). — What mileage does this experience cover ?

Mr. Ivanov. — More than 1 000 km.

Mr. Kumar. — How many years ?

Mr. Ivanov. — Since 1940-1942.

Mr. Kumar. — 10-15 years of experience and no difference at all. What length of the welded rails : 300, 500, 600 ft ?

Mr. Ivanov. — From 50 m to 1 km.

The President (in French). — I think we must bring this discussion to an end,

by saying that welded track does not show any appreciable difference from the point of view of undulatory wear to non-welded track.

« 9. In general, welded track shows no appreciable differences from the point of view of undulatory wear compared with ordinary non-welded track. »

— *The text adopted is as follows :*

— The meeting adjourned at 12.15 p.m.

Meeting of the 1st October 1958.

PRESIDENT : Dr. Ing. V. PERRONE.

— The meeting started at 9.30 a.m.

The President (in French). — Gentlemen, we will continue our work by examining Summary No. 10.

Mr. De Clercq (in French). — *Summary No. 10 :*

10. Certain observations make it possible to state that the use of check-rails results in a certain reduction in the depth of long wave undulatory wear, especially if there are no joints.

On the other hand, it appears that short wave undulatory wear disappears in line with level crossings equipped with check-rails.

The President (in French). — Any comments ? I will call upon Mr. JACKSON.

Mr. Jackson, South African Railways and Harbours. — I should just like to be clear that where they say « especially where there are no joints » it is in check-rails. It is elimination of the joints of the check-rails which reduces undulatory wear.

Mr. Kumar. — The absence of joints is required in the running rail of the track or in the check-rails.

Mr. Feyrabend (in French). — From the wording, it appears to refer to the check-rails.

Mr. Broca (in French). — The question is to decide whether the joints are or are not in the check-rails.

Mr. Prieto (in French). — The joints are in the check-rails.

The President (in French). — If they are in the check-rails, it is possible to delete the words « especially when they have no joints ».

Mr. Kumar. — The intention is to weld the check-rail to eliminate joints ?

Mr. Feyrabend (in French). — In the French text, it is quite clear; there is nothing to question.

Mr. Broca (in French). — It is simply a question of altering the English text.

Mr. Prieto (in French). — I suggest suppressing the end of the sentence : « especially if there are no joints ».

Mr. Kumar. — Well, it all depends on what information the Reporter has in his possession. If there are no joints, the fact may be included; if they have any, it should be deleted.

— *The text adopted is worded as follows with Mr. KUMAR's approval :*

« 10. Certain observations make it possible to state that the use of check-rails results in a certain reduction in the depth of long wave undulatory wear.

« On the other hand, it appears that short wave undulatory wear disappears in line with level crossings equipped with check-rails. »

Mr. De Clercq (in French). — *Summary No. 11 :*

11. The joints are a disturbing influence, but the data collected being contradictory, it is difficult to state whether they affect the formation or the development of the waves, or both together.

Mr. Kumar. — I suggest that the word « track » should be added before « joints » — « the track joints » — and the word « together » at the end should be removed.

The President (in French). — In the French and English texts. Any other comments ?

Mr. Feyrabend (in French). — I would like to read the reply made by the

S.N.C.F. : « Shocks due to the joints appear likely to have a very important influence on the starting and evolution of undulations, so increasing the length of the rails is bound to have favourable results. If, however, it is found that there is undulatory wear, though to a lesser extent it is true, on long welded rails, this is due to the fact that replacing a joint by welding does not completely cancel out the setting up of shock vibrations when a wheel passes over the rail ».

Our conclusions were based solely on the rails and we reported why welded rails still suffered undulatory wear, because replacing the joint by a weld never completely cancels out the discontinuity. The rolling stock always sets up vibrations.

Mr. Kumar. — Then I suppose if all agree on these facts the joints, whether they are welded or fishplated, are a disturbing influence. We should change the text to read : « The rail joints, whether welded or fishplated, are a disturbing influence ».

Mr. Feyrabend (in French). — Yes, I agree. « The ordinary or welded joints in the track have, to varying extents, a disturbing influence... »; « act to a different degree... », it is the idea of the starting point, the influence.

Mr. Kumar. — I was wondering whether the word « waves » should be replaced by the word « corrugations ». The French text may be perfectly all right. We call these waves rail corrugations. The word « waves » may perhaps be replaced by « corrugations ».

Mr. Upmark, Swedish State Railways. — I should say, why change the word « wave » ? I think that is the correct meaning; that is what is meant, but « corrugations », that is a small wave. It is much better as it stands, according to my opinion.

Mr. Kumar. — I have no objection, you can retain the word, I suppose the meaning is clear. We have been using « corrugation » as the word in our country, but if « wave » is preferred, I do not mind. I have no objection to retaining it.

Mr. Jackson. — Mr. CHAIRMAN, I think we must be careful here. We can get corrugations without getting wear. You can get corrugations due to the bending of the rail. Should we not in this be referring to the undulatory wear on the top of the rail ? I think the term « undulatory wear » is the better one.

Mr. Kumar. — Is it proposed to retain the word « waves » ? I have no objection.

Mr. Broca (in French). — On the whole, this discussion of the wording used means that it is not necessary to alter the English text.

The President (in French). — Does Mr. KUMAR agree ?

Mr. Kumar. — I agree.

Mr. Broca read out the final French text of *Summary No. 11*.

The President (in French). — Does everyone agree ? (*Agreed.*) *Summary*

No. 11 with its amendments is therefore *adopted*.

Mr. De Clercq (in French). — *Summary No. 12 :*

12. No conclusive information has been supplied concerning the influence of the sleepers. No precise law can be formulated concerning the influence of the material used for the sleepers and the type of fastening. However, it has not been proved that the kind and method of laying the sleepers has no effect on the formation and development of the waves.

Mr. Kumar. — I propose that the word « no » in the last but one line be replaced by the word « any ». It should then read : « has any effect on the formation and development of the waves ».

The President (in French). — Are there any other comments on this summary ?

Mr. Oggier, Secretary. — The last sentence will therefore read : « However, it has not been proved that the kind and method of laying the sleepers have any effect on the formation and development of the waves ».

Mr. Kumar. — « Kind of sleepers and the method of laying » would be better.

The President (in French). — Summary No. 12 is therefore *adopted* with the modification made to the *English text*.

Mr. De Clercq (in French). — *Summary No. 13 :*

13. It appears from an examination of the replies that a well laid layer of ballast is indicated to reduce undulatory wear. Some very large Administrations have found that there is an unfavourable influence on

lines laid on an insufficiently elastic bed, especially as regards long wave undulatory wear.

The President (in French). — Has anyone any comments to make about this summary ?

Mr. Upmark. — According to my opinion, «some very large Administrations» — why not delete «very large»? It is no difference whether they are large or not.

Mr. Kumar. — Yes, that is right. And I would say the last line should be «particularly in regard to the development of long wave undulatory wear» instead of «especially as regards long wave». It would then read: «There is an unfavourable influence on lines laid on an insufficiently elastic bed, particularly in regard to the development of long wave undulatory wear».

Mr. Feyrabend (in French). — I agree about the influence of beds having little elasticity. I see no reason for introducing this restriction on long wave undulatory wear. I think we might leave out «especially» and we would add: «on rock in particular». Long wave undulatory wear is caused by a great many other more characteristic causes than the bed. We would say: «Some Administrations have found that track laid on a bed lacking elasticity (in particular a bed on rock) has an unfavourable influence».

Mr. Kumar. — My comments are only with regard to the wording of the clause, because I have no personal experience of this. I am not certain that rocky formations

do encourage undulatory wear, but whether the deletion of long wave undulatory wear is justified or not, the Special Reporter can only help us on the basis of the reports he has received.

The President (in French). — It is therefore proposed that the final part be suppressed.

Mr. Prieto (in French). — Observations have been made in the case of long wave undulatory wear, but also in the case of short wave wear.

Mr. Broca (in French). — Is the last part of the sentence from «particularly» onwards to be suppressed?

Mr. Prieto (in French). — Yes, I agree with this.

Mr. Broca (in French). — And we will add «particularly on rocky foundations».

The President (in French). — Consequently, this summary is *adopted* with the amendments decided upon.

— *The final text reads as follows:*

« 13. It appears from an examination of the replies that a well laid layer of ballast is indicated to reduce undulatory wear. Some Administrations have found that there is an unfavourable influence on lines laid on an insufficiently elastic bed (particularly on rocky foundations). »

Mr. De Clercq (in French). — *Summary No. 14:*

14. The following factors favour the formation of undulatory wear: the non-sus-

pended weight in the case of electric traction, small diameter wheels and uniformity of such diameters, braking by means of cast iron shoes, conical tyres, small spacing between driving axles.

Mr. Kumar. — I would suggest that « the non-suspended weight in the case of electric traction » should be replaced by the words « the unsprung weight of traction motors », and « conical tyres » by « the conicity of tyres ».

The President (in French). — Are you agreed about these suggested modifications ? (*Agreed.*)

— *The text adopted for Summary No. 14 reads :*

« 14. The following factors favour the formation of undulatory wear : the unsprung weight of traction motors, small diameter wheels and uniformity of such diameters, braking by means of cast iron shoes, conicity of tyres, small spacing between driving axles. »

Mr. De Clercq (in French). — *Summary No. 15 :*

15. The influence of the profile of the lines cannot be determined, the statements made being too contradictory. This also applies to the influence of the locality : humidity, tunnels, corrosion.

The President (in French). — It seems to me that the expression « too widely divergent » is excessive. We should say : « the facts reported disagreed ».

Mr. Kumar. — The last sentence should be reworded thus : « This also applies

to the influence of the local conditions : *climate*, presence or absence of tunnels and incidence of corrosion ». Instead of « humidity », put in « climate ».

Mr. Feyrabend (in French). — Technically, I do not agree as far as tunnels are concerned. Our experience has shown that we never get any undulatory wear in tunnels. In tunnels, the rails wear more quickly. Consequently, the phenomenon has no time to occur, as the surface is constantly being worn down.

Mr. Prieto (in French). — The information received on this subject varied. Some stated that it occurred, others that it did not. We stated that there was this difference of opinion.

The President (in French). — Should we cross out « contradictory » ?

Mr. Feyrabend (in French). — According to the precisions made by the Reporter there is nothing to query. I mentioned our personal experiences. Perhaps, some other Administrations could give details of their experiences ? It would be interesting to learn what results others have obtained.

Mr. Kumar. — The Special Reporter has said that in tunnels where the formation is rocky there is an effect on the undulatory wear. Also it has been noticed that there is usually more corrosion in tunnels than elsewhere because of the smoke, particularly with steam traction, and because of high humidity arising from lack of ventilation, there is

more corrosion in tunnels, and corrosion is known to encourage undulatory wear. So that probably the absence or presence of tunnels may have an appreciable influence.

No, I have not got experience personally, but so far as is known it has an effect.

Mr. Prieto (in French). — The S.N.C.F. has not found any undulatory wear in tunnels, not even in those run through by steam trains where there is great deal of humidity.

Mr. Feyrabend (in French). — Not more than by the seaside. Wherever the rails wear quickly, there is no time for undulatory wear to form. To get undulatory wear, you must have slow wearing down of the rails.

Mr. Kumar. — I have not got experience personally, but so far as is known, it has an effect.

Mr. Prieto (in French). — On the Swiss and German railways, wear is also found in the tunnels.

Mr. Feyrabend (in French). — The Swiss railways are completely electrified; I do not know if the German railways are. I think it would have been better to change the text slightly.

The President (in French). — Can you suggest anything ?

Mr. Feyrabend (in French). — Everyone is agreed on the question of the profile.

No one raised any objections. There is no problem here. If you are agreeable it might however be interesting to continue this study in the case of areas in tunnels with serious corrosion.

Mr. De Clercq (in French). — Do you agree to the following text : « The influence of the profile of the line could not be determined in view of the diversity of opinions. This also applies to the influence of the locality. On the other hand, it would be of interest to continue these investigations in the case of tunnels ».

Mr. Feyrabend (in French). — In the case of the last sentence, I would suggest saying : « On the other hand, it would be of interest to continue more particularly the investigations in the case of tunnels and areas where there is serious corrosion ».

Mr. Kumar. — There are other influences besides these. It would be just as well to conduct research on those also.

Mr. Feyrabend (in French). — Certain things have to be eliminated, because they are not likely to supply any interesting data.

Mr. De Clercq (in French). — The first two factors, profile and locality, are not eliminated.

Mr. Kumar. — Any reference to research would be more appropriate in Summary No. 20.

Mr. Feyrabend (in French). — I have no objections to raise. I will only insist

on the fact that after the word « locality », we must add « tunnels and areas where there is serious corrosion ».

Mr. Kumar. — Yes, that is right. I agree.

— *The text adopted for Summary No. 15 is as follows :*

« 15. The influence of the profile of the lines cannot be determined, the statements made being too contradictory. This also applies to the influence of the locality. It would, however, be interesting to pursue research particularly into the effect of tunnels and sections subject to considerable corrosion. »

Mr. De Clercq (in French). — We now come to Chapter III : *Steps taken to avoid undulatory wear or to remedy it.* Summary No. 16 :

16. None of the existing types of fastenings can completely prevent undulatory wear which is to a large extent a function of the nature of the metal. It still remains to ascertain whether the evolution of the phenomenon can be influenced, since the introduction of elastic components into the fastenings is relatively recent.

The President (in French). — Any comments ?

Mr. Kumar. — I would like to modify the first sentence like this : « Being a function of the nature of the metal the undulatory wear cannot be completely prevented by the existing types of fastenings ». I suppose that was the idea of the Reporter, he wants to say that it is the undulatory wear which is something

connected with the nature of the metal, although he has rather over-simplified the problem. In the second sentence : instead of the words « elastic components », « elastic features » should be used.

Mr. Upmark. — I would like to ask : are we really sure that the Reporter says this ? Personally, I have the same opinion, but he has written what has been written in the report. But we are not sure of there being any question of the metal. He has noted that several Administrations have found this, but if you change the sentence as Mr. KUMAR suggested, you will get another meaning into it. Mr. KUMAR has altered it, but I do not think it has been said by the Reporter.

Mr. Kumar. — It is a fact that to a large extent undulatory wear is a function of the metal, but this aspect has already been included as one of the factors in Summary No. 2.

It should be simply stated that undulatory wear cannot be prevented by any of the existing types of fastenings.

Mr. Jackson. — I think we should delete all mention of the function of the metal because there are some kinds of undulatory wear which have got nothing to do with the type of metal at all. I think we should just say that none of the existing types of fastenings can completely prevent undulatory wear.

Mr. Kumar. — Yes, delete that classification clause. It should be : « The undulatory wear cannot be completely prevented by any of the existing types of fastenings ».

Actually, I wonder if this clause can appropriately come under the title « Heading III : Steps taken to avoid undulatory wear or to remedy it ».

Mr. Feyrabend (in French). — This is a step that has been tried, but was not successful. It must however be mentioned. Otherwise, readers in 10 or 15 years time might think it had not been mentioned.

Mr. Kumar. — I would say : « The use of the elastic features in the recent designs of fastenings may perhaps help to reduce undulatory wear, but it is too early to say so as such fastenings have only recently been introduced ».

Mr. Feyrabend (in French). — What sort of a text would that be ? It was agreed that we would delete the reference to the metal. There only remains to deal with the elastic fastenings. We stated in our reply that it was impossible to formulate any law concerning the type of fastenings used. I think that if the reference to the metal is deleted, this will be sufficient.

Mr. Broca (in French). — We might say : « None of the existing types of fastenings completely prevents undulatory wear. It remains to see if the evolution of the phenomenon... »

The President (in French). — Does this text meet with your approval ?

Mr. Feyrabend (in French). — Instead of saying : « None of the existing types of fastenings », perhaps we could say : « None of the classic types of fastenings »,

because there are now some elastic fastenings available.

Mr. Prieto (in French). — We might simplify this paragraph and simply say : « trials made with different types of fastenings... » ... « The results have no appreciable influence as regards improvement. »

Mr. Broca (in French). — « However, experience of elastic types of fastenings is too recent... »

The President (in French). — « None of the classic types of fastenings can completely prevent undulatory wear. However, the use of elastic fastenings... »

Mr. Feyrabend (in French). — We must delete the word « however ».

The President (in French). — « The use of elastic fastenings is too recent for the results to be known. »

Mr. Feyrabend (in French). — Yes, in practice, we think we know what these effects will be. We might say : « The use, still recent, of elastic fastenings, does not allow of positive conclusions ». I think we must be cautious; if in four years time, we can go into the matter again, we will come to a negative conclusion.

Mr. Oggier. — The English version would be : « Undulatory wear cannot be completely prevented by any of the existing types of conventional fastenings. However, the use of elastic components in fastenings is too recent to determine their effects ».

Mr. Jackson. — Mr. CHAIRMAN, that is still incorrect. Can I suggest an alternative different approach : « No type of fastening has as yet been proved to prevent undulatory wear. The introduction of fastenings with elastic components is of too recent origin to permit of a conclusion being drawn with regard to their effect ». That leaves the matter wide open.

Mr. Kumar. — Instead of the word « component » the word « feature » would do.

Mr. Feyrabend (in French). — I understood the text more or less, but I would have liked to have the French translation.

Mr. Broca read out the French text.

The President (in French). — We are therefore agreed fundamentally, and we can go on to the next summary.

— *Summary No. 16 is adopted with the following text :*

« 16. No type of existing conventional fastening has yet been proved to prevent undulatory wear. The introduction of fastenings with elastic features is of too recent origin to permit of a conclusion being drawn with regard to their effect. »

Mr. De Clercq (in French). — *Summary No. 17 :*

17. Increasing the number of sleepers appears to have a beneficial effect on long wave undulatory wear; this is not so, however, in the case of short waves, according to the observations of nearly all the Administrations.

Mr. Feyrabend (in French). — I would like to ask the same question as at yesterday's meeting : are we not confusing undulatory deformation with undulatory wear due to the sleepering, because we have observed very great long wave undulatory wear with close sleeper spacing in suburban areas where units with nose suspended motors are used ?

Mr. Prieto (in French). — Undulatory deformation is included in the wear. It may be stated that all long wave wear implies some deformation which may affect only the upper part of the rails or the whole rail. But this phenomenon is, I think, due to the same causes.

Mr. Feyrabend (in French). — No, that is not my opinion, because the deformation of the upper part with long wave undulations seems to us to be linked up with certain kinds of traffic, etc... whereas deformation of the whole rail occurs with inadequate rails, on lines with steam traffic for example. These are two completely different things : long wave deformation and long wave undulatory wear of the running surface.

Mr. Kumar. — The deformation of the track as a whole between sleepers, having a sort of high point between the sleepers, can occur if the track is very light in relation to the traffic it carries. Confusion may have occurred in some minds between the deformation of the track as a whole and the undulatory wear on the surface of the track rail.

Mr. Jackson. — We have a very severe type of long wave undulatory wear in

South Africa which occurs on very sharp curves, and there we have experimented by close sleepers on the curves, and it has had no effect on them at all.

Mr. Kumar. — Does that then support the view that probably some Administrations got mixed up — that while reporting they have included the wavy deformation of the track as a whole in undulatory wear of rails.

Mr. Prieto (in French). — It might be said under these conditions increasing the number of sleepers only appears to have any effect in certain cases. What cases are these ? and particular circumstances with such cases... We might say : « ... beneficial effect in certain cases ».

Mr. Feyrabend (in French). — It would have been better to say : « on the long wave undulatory wear », because the Reporter said that he had received statements from Administrations in connection with long wave wear. Could we know the names of these Administrations ? It might be misinterpretation of the replies which has given rise to confusion. It is annoying that very few Administrations are represented at the meeting.

The President (in French). — We might say : « Increasing the number of sleepers has a certain beneficial effect on undulatory wear... »

Mr. Feyrabend (in French). — No, no.

The President (in French). — As most of the Delegates seem to disagree about this summary, we might suppress it.

Mr. Kumar. — Yes, I agree with that.

Mr. Feyrabend (in French). — We are all agreed about the deformation.

The President (in French). — Then, the wording will have to be modified.

Mr. Feyrabend (in French). — The fact that must be retained is that they have no effect upon short wave wear. The second part must be retained. I would say : « Increasing the number of sleepers does not seem to have a beneficial effect upon undulatory wear ». That is all.

Mr. Kumar. — That is only a negative aspect. There is no use putting a negative aspect when you mention at the top : « The steps taken to avoid undulatory wear or to remedy it ».

Mr. Feyrabend (in French). — I think we all agree with the text suggested by Mr. FEYRABEND.

Mr. Kumar. — The wording is all right, but whether that is a step taken to remedy undulatory wear is not altogether appropriate. However, it does not matter.

— *The text adopted is the following :*

« 17. Increasing the number of sleepers does not appear to have a beneficial effect on undulatory wear. »

Mr. De Clercq (in French). — *Summary No. 18 :*

18. The practice of grinding the rails must undoubtedly attract the attention of the Administrations, both grinding during maintenance and that practised before putting new rails into service. It should

be pointed out, however, that the value of grinding before putting rails into service has not yet been proved.

Mr. Kumar. — I would suggest that this should be reworded : « The practice of grinding the rails before and after laying has been adopted by many Administrations ». The second sentence to remain as it is.

I would like to modify it : « The practice of grinding the rails before and after laying, *as an item of maintenance, has been adopted* ».

Mr. Feyrabend (in French). — No, that changes it, because we have ground the rails during maintenance but never before laying them.

Mr. Kumar. — The Special Reporter says « that practised *before* putting new rails into service ». If it is not a common practice, if the practice of grinding before laying is not common, then we should modify the sentence; that wording should be changed : « The practice of grinding rails in the track to remove undulatory wear has been adopted by many Administrations, some even go to the extent of grinding the rails *before* laying ». Another version is : « The practice of grinding away the corrugations on rails has been adopted by many Administrations, some even go to the extent of grinding the rails before laying them in the track ».

Mr. Feyrabend (in French). — But which ?

Mr. Prieto (in French). — It does not say which Administrations have adopted this practice of grinding.

Mr. Feyrabend (in French). — There must be some mistake. It must be a question of grinding the rails that are to be re-used in the shops. But as for new rails, there is no question of it.

The President (in French). — It can only relate to new rails.

Mr. Kumar. — No, it was news to me that anybody should grind new rails. It would remove the rolled surface skin, which I think is very durable, but maybe the practice is in vogue in some very progressive Administrations like Switzerland and it is for the engineers who represent those railways to tell us.

Mr. Feyrabend (in French). — I think I can reply that those who grind in the shops, grind worn rails. According to Mr. KUMAR, the Indian Railways no longer employ preventative grinding of new rails. I think that this is a very wide spread operation at the present time. Everyone grinds the rails on the track. Our problem is : « measures taken to prevent undulatory wear ». On the other hand, the phrase « call attention » concerns the future; it does not seem to be the right expression when we are dealing with the present.

Mr. Kumar. — We have found in the new rails just going out of a steel mill, incipient corrugations. Some railways may have gone to the trouble of removing them by grinding. But if no railway grinds new rails, then we should delete that part referring to grinding of rails before laying.

Mr. Feyrabend (in French). — I suggest the wording which has just been given : « the practice of maintenance grinding of rails is used by many Administrations », and this is all. It is a firm conclusion.

Mr. Oggier. — The English text would be : « The practice of grinding away the corrugations as an item of maintenance has been adopted by many Administrations », and the reference to new rails suppressed.

Mr. Kumar. — Yes, yes. The second sentence, I suppose, has been deleted.

Mr. Feyrabend (in French). — I would like to call the attention of the Meeting to the confusion there may have been in the replies between grinding on the track and grinding worn rails in the shops.

Mr. Prieto (in French). — In conclusion, we might simply say : « maintenance grinding of the rails is practised by many Administrations », making no mention of new rails.

Mr. Feyrabend (in French). — « The elimination of undulatory wear during maintenance is obtained by grinding by many Administrations. »

— *Summary No. 18 is adopted with the following text :*

« 18. The practice of grinding rails as an item of maintenance has been adopted by many Administrations. »

Mr. De Clercq (in French). — *Summary No. 19 :*

19. Heat treatment before laying, by annealing, and after laying, by blowlamp, is very costly. The result of such operations is uncertain.

Mr. Kumar. — I would suggest that it should be : « Heat treatment before laying, by annealing, and after laying, by blow lamp, has not proved effective ». Because it is exactly what he has stated in his report in item 6 in the English version, on page 117. Heat treatment before and after undulatory wear has formed is not effective.

Mr. Prieto (in French). — But the trials of annealing the rails before laying them were made expressly to reduce undulatory wear. In the report, it says that treated rails are more susceptible to undulatory wear than rails which have not been treated.

Mr. Feyrabend (in French). — **MR. PRESIDENT**, I would like to say that from our experience, heat treatment is more likely to be harmful. The Reporter also mentions annealing the whole rail, which is rather a special case, about which we have no experience. In the summary, a distinction should be made between the surface heat treatment for annealing the rails which is a quite different operation. From our experience, surface treatment is not at all favourable. It may seem to be so for a few years, and then in the end it is in fact harmful. I suggest, therefore, that we say : « Trials of surface heat treatment... treatment by blowtorch... », these are two distinct ideas.

Surface treatment is very expensive and gives no results from the point of view of undulatory wear.

Mr. Broca (in French). — You stated that surface heat treatment could even be harmful.

Mr. Feyrabend (in French). — Yes, but not immediately, in the long run.

Mr. Kumar. — As a matter of fact, in the text, the Special Reporter has said that the heat treatment of rails has proved adverse and has not, at all, benefited the removal of the undulatory wear.

Mr. Feyrabend (in French). — It can be harmful.

Mr. Kumar. — He actually has said that heat treated rails are more prone to undulatory wear; he has said so in the text.

Mr. Feyrabend (in French). — Under these conditions, it becomes necessary to modify the summary.

Mr. Kumar. — Ask the Special Reporter whether he sticks to the statement that heat treated rails are more prone to undulatory wear? Then, the heat treatment is something which has an adverse effect. Then we should say so in the summary also.

Mr. Broca (in French). — Will you agree to say that, in fact, the effects may be harmful in the long run?

Mr. Feyrabend (in French). — Yes, in the long run. To begin with, the wear appears to start less quickly, but afterwards such phenomena as flaking of the surface become much more serious and

disastrous than mere undulatory wear. This is why I wish to make it clear that it is only after a certain number of years that the drawbacks are discovered.

Mr. Kumar. — In fact, I would say it *is* detrimental, not in the long run. What is the proposed text?

Mr. Broca (in French). — « Heat treatment, both before laying, by annealing, or after laying, is very costly. The result of these operations appear to be harmful in the long run. »

Mr. Feyrabend (in French). — We have never done any annealing. We could perhaps say: « the result of such operations appears uncertain in the first case and harmful in the second ». We do not know if it is in the first case. I do not like to speak of matters about which I know nothing. The two things must be kept apart. I think that in the case of heat treatment, we should say: « before or after laying ». Annealing is always done before laying. Would you please re-read the whole sentence?

Mr. Broca (in French). — « Heat treatment before laying, by annealing, and either before or after laying by torch, is very costly. Whereas the result of heat treatment by annealing appears to be uncertain, heat treatment by torch appears to be harmful in the long run. »

Mr. Kumar. — In my opinion, the emphasis is unnecessarily on cost. If the cost aspect has to be mentioned then we should say that it is more costly than grinding, but the important aspect is that

heat treatment by blowlamp and annealing has not proved effective. That is what is significant. If the cost is an important point then it should be said that the cost is higher than that of grinding.

Mr. Feyrabend (in French). — I know nothing about that. Calculations would have to be made to find out if it is profitable.

Mr. De Clercq (in French). — There is no point in comparing the costs, since we do not know the results.

Mr. Kumar. — But the Reporter has said so in his report, on page 107 of the English text, that it is more costly than grinding. The results are uncertain and the cost is higher than that for grinding. But since he has brought in the cost question, if you want to include this aspect then you should say that the cost is higher than that of grinding.

Mr. Upmark. — Why should we talk about comparing costs here? There is no need. We should just say it is costly, we don't need to compare with anything. Just say it is costly, how much we don't need to talk about at all.

— *The following text was finally agreed :*

« 19. Heat treatment before laying, by annealing, and either before laying or after laying by blowlamp, is very costly. Whereas the result of heat treatment by annealing appears to have uncertain effects, heat treatment by blowlamp appears to be detrimental in the long run. »

Mr. De Clercq (in French). — We now come to *Chapter IV : Systematic research. Summary No. 20 :*

20. The trials and researches put in hand on small sections by certain Administrations are of very recent date, and it is too soon to formulate any final conclusions. However, the following results may be mentioned :

The chemical composition, heat treatment and method of fabrication have a well determined influence upon the various types of undulatory wear.

Certain rails, especially those made of Thomas steel, show pronounced undulatory wear, whilst rails made of Martin-Siemens steel with a low nitrogen content, remain exempt or are only slightly affected.

The effect of increased stressing of the rails by the rollers produces the original undulations.

The behaviour of rails made of Thomas steel, elaborated with an oxygen rich blast, is similar to that of Martin-Siemens rails.

The behaviour of annealed rails is also favourable.

In places where undulatory wear exists, it has been possible to determine that the vehicles do not vibrate at the same frequency as that of the undulations.

The method of laying has very little effect upon undulatory wear.

Rubber plates have very little effect on the development of undulatory wear.

It has been found possible to reproduce undulatory wear in the laboratory; however, the trials not being completed as yet, it is premature to formulate any conclusions.

Mr. Kumar. — Now this is rather a lengthy conclusion and it would be better to make it quite clear that there are certain indications which recent researches have brought about, and these should be properly arranged rather than put in a loose form as they are presented here. These indications refer : first, to the heat treatment; secondly, to the method of manufacture of steel; thirdly, to the use

of annealing; fourthly, to the effect of stressing of rails; and fifthly, to the effect of vibrations on rails during manufacture. Later the method of laying of rails in the track has been shown to have no effect. Before suggesting any modifications to the wording, I should like to know, whether the contention that « the method of laying has very little effect on undulatory wear » — (this was discussed yesterday also) — is based on certain trials ? Similarly, the statement « rubber plates have very little effect on undulatory wear »; is that the result of trials ? I suppose the Special Reporter can throw light on this.

The President (in French). — I would like to call your attention to the first paragraph where it says : « trials and researches put in hand on small sections by certain Administrations are of very recent date and it is too soon to formulate any final conclusions. However, the following results may be mentioned ».

Mr. Prieto (in French). — These systematic results are a summary of the research work carried out by the German and French railways. The trials were only on a small scale. These conclusions are somewhat provisional. They are not capital affirmations.

Mr. Kumar. — Still, they are based on researches and trials. That being so, we can now go about the various issues, one by one, and redraft this summary. I would suggest that the first paragraph may be modified like this : « The trials and researches on a small scale have been recently started by some Administrations,

but it is too early to formulate any final conclusions. However, the following indications have been obtained ».

Mr. Feyrabend (in French). — Agreed. The trials were perhaps on a small scale, but the researches covered all the causes. It was what actually existed that was being observed.

Mr. Kumar. — The « small scale », I presume, applies both to trials and researches. Then we should put down : « The researches and subsequent trials on small sections... »

Mr. Feyrabend (in French). — We should say « the researches and trials undertaken on small sections... » You could reverse « researches » and « trials ».

Mr. Broca (in French). — The text will be : « The researches and trials undertaken on small sections by certain Administrations are very recent and it is too soon to formulate any final conclusions. The following points can however be retained ».

Mr. Kumar. — Agreed.

The President (in French). — Are we all agreed about the first point, the chemical composition ?

Mr. Feyrabend (in French). — It is the words « well defined » which must be deleted. It is too affirmative. We don't know enough to put this. It has an influence, but basically what is it ? We are only just making a beginning.

Mr. Kumar. — Then let us say « have a slight effect », « appreciable effect », « significant effect ». **Mr. FEYRABEND** simply wants to say « have an effect ». All right. It all depends on what reports received indicate. When the Reporter said « well-determined », I thought he meant « considerable » or in any case « appreciable ».

Mr. Feyrabend (in French). — Personally, I would just have said « an influence » and leave it at that. But there is not harm in putting a « certain influence ».

The President (in French). — Are you all agreed about this text ?

Mr. Prieto (in French). — I agree we should suppress « well determined ».

Mr. Broca (in French). — A modification to the wording of the English text does not appear to have any effects on the French text. We now come to the third paragraph.

Mr. Kumar. — And the second indication is : « Certain rails, especially those made of Thomas steel, show pronounced undulatory wear, while rails made of Martin-Siemens steel with a low nitrogen content remain... »; instead of « exempt » I would say « remain free » or « almost free ».

Mr. Feyrabend (in French). — It says « remain exempt from »; the word « exempt » is perhaps a little strong. I would delete « remain exempt » and say « are only slightly affected ».

Mr. Kumar. — Yes, I agree. It is only a question of fact. Then the next indication : « the effect of increased stress of the rails by the rollers produces the original undulations ». I don't quite understand what it means. Will the Special Reporter please tell us what it means ? « The effect of increased stressing of the rails by the rollers produces the original undulations. » Is he talking about the stage when the rollers bring about pressure to straighten the rails ? They produce the undulatory wear in the nascent stage. Now I am beginning to understand what the meaning is. If the meaning is that the rollers while straightening the rails produce the corrugations in the nascent stage, then I agree that they do, because we have noticed that also, we have found these corrugations in the incipient stage, but not in all the rails, only in some. Therefore, they are not produced in all cases. So we would put this clause like this : « The passing of the rails through the rollers during straightening sometimes produces corrugations in a nascent stage ».

Mr. Feyrabend (in French). — Rolls is the correct name. It is a machine which straightens the rails as they leave the mill.

Mr. Broca (in French). — I think the problem only arises in the case of the English text. In the French text we said : « des ondulations originelles ». We simply say : « il y a production d'ondulations originelles ».

Mr. Feyrabend (in French). — It is presumed.

Mr. Broca (in French). — In the English text it is affirmed.

Mr. KUMAR, this is the translation : « the passage of the rails through the rolls whilst being straightened sometimes may produce undulations in the original stage ».

Mr. Feyrabend (in French). — I think the text is somewhat affirmative.

Mr. Broca (in French). — That is why **Mr. KUMAR** said « may produce ».

Mr. Feyrabend (in French). — I think we might have said : « it appears that there is some relation between the increased stressing of the rails by the rolls and the beginnings of undulatory wear ».

Mr. Kumar. — All right. Now, the summary next goes on to say that « the behaviour of rails made of Thomas steel, elaborated with an oxygen-rich blast, is similar to that of Martin-Siemens rails ». I would suggest that this clause should be brought before the question of stressing by rollers because it will immediately follow the one dealing with Thomas steel rails. (*Agreed.*)

Now, the only thing left is the expression : « elaborated with an oxygen-rich blast ». I would suggest rewording thus : « The behaviour of rails of Thomas steel made with an oxygen-blast... » — « elaborated » may be cut out — or « produced with an oxygen-blast ». « The behaviour of rails made of Thomas steel produced with an oxygen-blast is similar to that of Martin-Siemens rails. »

The next is : « The behaviour of annealed rails is also favourable ». That

seems all right, except that the word « behaviour » may be substituted by « performance ».

Mr. Feyrabend (in French). — That makes no change in the French text and contradicts what was said just now. I think we should suppress this paragraph.

Mr. Jackson. — **Mr. CHAIRMAN**, I think we have got mixed up with annealed rails and heat treated rails. I think we shall have to alter the Summary No. 19. It is not treatment by annealing but sulfitic and non-sulfitic.

Mr. Kumar. — The annealing will naturally make the grain more fine.

Mr. Jackson. — I think the annealing they are referring to here, judging by the previous correspondence on page 108 in the English version — trials of annealing rails in a tempering furnace — refers to controlled cooling. I think that is what is meant here.

Mr. Kumar. — Does this suggest : « ... The behaviour of rails which have undergone controlled cooling during manufacture or some other treatment ».

Mr. Broca (in French). — This phrase « the behaviour of annealed rails is also favourable » contradicts all our discussions. We came to the conclusion that annealing was uncertain and superficial heat treatment harmful.

The President (in French). — I think we should suppress this paragraph.

Mr. Feyrabend (in French). — Controlled cooling, is very different from the heat treatment we are dealing with just now.

Mr. Prieto (in French). — « The behaviour of heat treated rails is also favourable. » Trials have been made by the German and Swiss railways of annealing in a furnace, followed by further straightening in a press. The German railways got good results.

Mr. Feyrabend (in French). — That was the result of an experiment. A conclusion based on a single experiment is rather rash. Those who read the Reporter's report can find the reference to it, but to base a summary upon a single experiment appears imprudent.

Mr. De Clercq (in French). — Are you all agreed to suppress this sentence ?

Mr. Feyrabend (in French). — Absolutely. (*The Meeting agreed.*)

Mr. Kumar. — Concerning the next paragraph : « In places where undulatory wear exists, it has been possible to determine that the vehicles do not vibrate at the same frequency as that of the undulations », I would put in this way : « that the pitch of the undulations does not seem to correspond with the natural period of vibration of the vehicles ». I will substitute « does not seem to correspond » instead of « does not correspond ». I suppose that is what the Special Reporter meant unless he is quite sure about the statement.

I would wish to modify my previous

draft by saying « that the natural periods of vibration of the vehicles do not seem to correspond with the vibrations produced by the undulations ».

Mr. Feyrabend (in French). — We must add « the length of wave », which makes the sentence clear. It is not mathematically correct, but it is comprehensible.

Mr. De Clercq (in French). — Could we not state that there is concordance ?

Mr. Feyrabend (in French). — No, there is not concordance. It is necessary to say the length of the wave.

Mr. Broca (in French). — « ... does not vibrate at a frequency which corresponds to the wave length of the undulations. »

Mr. Feyrabend (in French). — That would do.

Mr. Broca (in French). — The whole thing was to take away this vibration from the undulatory wear.

Now, Mr. KUMAR has expressed another idea. He suggests : « the frequency of vibration of vehicles does not seem to correspond to the frequency set up by the undulatory wear ».

Mr. Feyrabend (in French). — It springs from the same idea, but it is a very cumbersome phrase.

Mr. Broca (in French). — We are speaking of the wave length.

Mr. Feyrabend (in French). — You are re-introducing the speed. There is no

problem. The idea is the same, but the sentence is longer. The important idea is that there is no correspondence in phase between the vibration set up by the track and the vibration of the axles. From a technician's point of view, it says all that need be said.

Mr. Broca (in French). — « The period of true vibration does not seem to correspond to the vibrations caused by undulatory wear. »

Mr. Feyrabend (in French). — You have two vibrating systems. It is the vibrations set up in the vehicle by the undulatory wear of the rail. This is why the first text seems the better to me. We need a conditional ... « which might be produced ».

Mr. Kumar. — Which would be *expected* to be produced, there is no question of *should* be produced. The same pitch will always produce the same vibrations at a particular speed — in English « would » be a better word than « should » in the text.

Mr. Broca (in French). — The French text will read : « Aux endroits où il y a de l'usure ondulatoire, on a pu déterminer que les véhicules ne vibrent pas à la fréquence qui serait entraînée par la longueur d'onde de l'usure ondulatoire ». (*Agreed.*)

We will go on to the next paragraph.

Mr. Kumar. — Then, the next paragraph is : « The method of laying has very little effect upon undulatory wear ». This is perfectly harmless, it may stay as

it is. Next : « Rubber plates have very little effect on the development of undulatory wear ». I should replace the word « plates » with « pads ». And the last conclusion : « It has been found possible to reproduce undulatory wear in the laboratory ; however, the trials not being completed as yet, it is premature to formulate any conclusions ». I would say the second part of this is not necessary, because the same idea has been expressed in the first sentence of this summary. The only thing needed is : « It has been found possible to reproduce undulatory wear in the laboratory » and finish there. The rest has already been said in the first paragraph, namely that no conclusions can yet be formulated.

There then remains the third part of Summary No. 15 which it had been suggested should be included in Summary No. 20.

Mr. Feyrabend (in French). — As regards the phrase about investigations into the influence of corrosion, I think it would be better to leave this at the end of Summary No. 15.

Mr. Kumar. — I agree.

The President (in French). — Mr. KUMAR suggests putting at the beginning of Summary No. 20 the sentence : « It has been found possible to reproduce undulatory wear in the laboratory ». (*Agreed.*)

— *The complete text adopted for Summary No. 20 is as follows :*

« 20. It has been found possible to reproduce undulatory wear in the labo-

ratory. Researches and trials on small sections have recently been started by some Administrations, but it is too early to formulate any final conclusions. However, the following indications have been obtained :

« — The chemical composition, heat treatment and method of fabrication have an effect upon the various types of undulatory wear.

« — Certain rails, specially those made of Thomas steel, show pronounced undulatory wear, whilst rails made of Martin-Siemens steel with a low nitrogen content remain almost free.

« — The behaviour of rails made of Thomas steel, manufactured with an oxygen rich blast, is similar to that of Martin-Siemens rails.

« — There appears to be a correlation between the increased stressing of rails during the process of straightening during

manufacture and the production of nascent corrugations.

« — In places where undulatory wear exists, the period of natural vibrations of the vehicles does not seem to correspond to vibrations which would be produced by corrugations.

« — The method of laying has very little effect upon undulatory wear.

« — Rubber pads have very little effect on the development of undulatory wear. »

The President (in French). — Gentlemen, this brings us to the end of our examination of the Summaries for Question 9. I thank, most warmly, all the Delegates who have collaborated in our work.

Our next meeting will take place tomorrow and will be devoted to discussing Question 10.

— The meeting ended at 12.45 p.m.

DISCUSSION AT THE PLENARY SESSION.

Meeting of the 3rd October 1958.

PRESIDENT : Sr. D. AGUSTÍN PLANA.

GENERAL SECRETARIES : Messrs. P. GHILAIN and J. PÉREZ POZUELO.

The President (in French). — We now come to the Summaries for Question 9.

Mr. Ghilain, General Secretary, read the Summaries agreed by the Section, which were published in Nos. 2 and 3 of the *Daily Journal of the Congress*.

(The examination of these Summaries did not give rise to any comment.)

The President (in French). — We can therefore consider the Summaries for Question 9 as ratified.

SUMMARIES.

I. Types and characteristics of undulatory wear of rails.

« 1. The different types of undulatory wear can be classified into two groups :

« (a) Short wave undulatory wear, the length of wave being 0.02 to 0.08 m (0.08 to 3.1 in.) (most frequently 0.043 m = 1.7 in.), and the depth 0.12 mm (0.005 in.) (maximum of 0.4 mm = 0.02 in.).

« (b) Long wave undulatory wear, with which the length of wave varies between 0.10 and 2 m (3.9 in. and 6 ft. 7 in.), the depth being 5 mm (0.2 in.) and over.

« 2. The commencement and development of undulatory wear are extremely complex phenomena which it is very difficult to explain completely.

« The factors which can have an influence upon undulatory wear are essentially :

« (a) the material and method of fabrication of the rails;

« (b) vibrations of the rail;

« (c) rail-wheel pressure and reactions of the rail-wheel system under the influence of the rolling stock;

« (d) oxidation due to friction;

« (e) the rolling stock;

« (f) the profile of the lines;

« (g) the kind of traffic;

« (h) the method of laying;

« (i) the rigidity of the bed.

« 3. The damage caused by undulatory wear is far from negligible and is worth taking into consideration.

« Most of the railways have found that on lines showing serious undulatory wear there is rapid general deterioration of the track, loosening of the rail fastenings, coachscrews and bolts,

« ovalisation of the coachscrew holes,
« loosening of the anti-creep devices,
« disturbance of the bed, sleepers and
« ballast.

« It can definitely be stated that more
« rapid deterioration of the sleepers has
« been noted in sections with serious
« undulatory wear.

« 4. Again, loosening of bolts and
« rivets in metal bridges has been ob-
« served.

« 5. In general, the vibrations set up
« by undulatory wear have a destructive
« effect upon the various parts of the
« rolling stock, but it is difficult to eva-
« luate the extent of the damage caused.

II. Investigation into the causes of undulatory wear.

« 6. The composition of the metal
« plays an important part in the forma-
« tion of undulatory wear. For exam-
« ple, Martin-Siemens rails are generally
« less subject to short wave undulatory
« wear than Thomas steel rails. A low
« nitrogen content improves the resist-
« ance to wear of rails manufactured by
« these two processes. Heat treated
« rails are more vulnerable to it than
« those which have not been so treated.

« 7. Rails which have been straight-
« ened upright during manufacture tend
« to show more marked undulatory
« wear.

« 8. Undulatory wear affects rails of
« all weights. Short wave undulatory
« wear may perhaps be more apparent
« with heavy rails.

« 9. In general, welded track shows
« no appreciable differences from the
« point of view of undulatory wear
« compared with ordinary non-welded
« track.

« 10. Certain observations make it
« possible to state that the use of check-
« rails results in a certain reduction in
« the depth of long wave undulatory
« wear.

« On the other hand, it appears that
« short wave undulatory wear disappears
« in line with level crossings equipped
« with check-rails.

« 11. The rail joints whether fish-
« plated or welded are disturbing in-
« fluences, though to a different degree,
« but the data collected being contra-
« dictory, it is difficult to state whether
« they affect the formation or the de-
« velopment of the waves, or both.

« 12. No conclusive information has
« been supplied concerning the influence
« of the sleepers. No precise law can
« be formulated concerning the influence
« of the material used for the sleepers
« and the type of fastening. However,
« it has not been proved that the kind
« of sleepers and their method of laying
« have any effect on the formation and
« development of the waves.

« 13. It appears from an examination
« of the replies that a well laid layer
« of ballast is indicated to reduce un-
« dulatory wear. Some Administrations
« have found that there is an unfavour-
« able influence on lines laid on an
« insufficiently elastic bed (particularly
« on rocky foundations).

« 14. The following factors favour
« the formation of undulatory wear : the
« unsprung weight of traction motors,
« small diameter wheels and uniformity
« of such diameters, braking by means
« of cast iron shoes, conicity of tyres,
« small spacing between driving axles.

« 15. The influence of the profile of
« the lines cannot be determined, the
« statements made being too contra-
« dictory. This also applies to the
« influence of the locality. It would,
« however, be interesting to pursue re-
« search particularly into the effect of
« tunnels and sections subject to consi-
« derable corrosion.

III. Steps taken to avoid undulatory wear or to remedy it.

« 16. No type of existing conven-
« tional fastening has yet been proved
« to prevent undulatory wear. The in-
« troduction of fastenings with elastic
« features is of too recent origin to per-
« mit of a conclusion being drawn with
« regard to their effect.

« 17. Increasing the number of sleep-
« ers does not appear to have a bene-
« ficial effect on undulatory wear.

« 18. The practice of grinding rails
« as an item of maintenance has been
« adopted by many Administrations.

« 19. Heat treatment before laying,
« by annealing, and either before laying
« or after laying by blowlamp, is very
« costly. Whereas the result of heat
« treatment by annealing appears to
« have uncertain effects, heat treatment
« by blowlamp appears to be detri-
« mental in the long run.

IV. Systematic research.

« 20. It has been found possible to
« reproduce undulatory wear in the
« laboratory. Researches and trials on
« small sections have recently been
« started by some Administrations, but
« it is too early to formulate any final
« conclusions. However, the following
« indications have been obtained :

« — The chemical composition, heat
« treatment and method of fabrication
« have an effect upon the various types
« of undulatory wear.

« — Certain rails, specially those
« made of Thomas steel, show pro-
« nounced undulatory wear, whilst rails
« made of Martin-Siemens steel with a
« low nitrogen content remain almost
« free.

« — The behaviour of rails made of
« Thomas steel, manufactured with an
« oxygen rich blast, is similar to that of
« Martin-Siemens rails.

« — There appears to be a correla-
« tion between the increased stressing of
« rails during the process of straighten-
« ing during manufacture and the pro-
« duction of nascent corrugations.

« — In places where undulatory wear
« exists, the period of natural vibrations
« of the vehicles does not seem to cor-
« respond to vibrations which would be
« produced by corrugations.

« — The method of laying has very
« little effect upon undulatory wear.

« — Rubber pads have very little
« effect on the development of undu-
« latory wear. »

QUESTION 10.

In view of the development of light railways, what are the means to be adopted in order to reduce the operating costs of these railways and what are the resulting basic amendments ?

- Delimitation of electrification and dieselisation in relation to the traffic, capital costs and operating costs.
- Co-ordination between rail and road :
- Possibilities of mixed rail-road vehicles and of specialised vehicles for rail or road.
- Principles to be followed in regard to investment, in order to improve the returns from the capital available for the transport industry.

Preliminary documents.

Report (Austria, Belgium and Belgian Congo, Bulgaria, Cambodia, Czechoslovakia, Denmark, Ethiopia, Finland, France and French Union, Western Germany, Greece, Hungary, Indonesia, Italy, Lebanon, Luxemburg, Netherlands, Poland, Portugal and overseas territories, Rumania, Siam, Spain, Switzerland, Syria, Turkey, Viet-Nam and Yugoslavia), by Dr. Eng. E. STAGNI. (See *Bulletin* for August 1958, p. 1215.)

Australia [Commonwealth of], Burma, Ceylon, Egypt, India, Irak, Iran, Republic of Ireland, Japan, Malaysia, New Zealand, Norway, Pakistan, South Africa, Sudan, Sweden, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland and dependent overseas territories, by S. L. KUMAR. (See *Bulletin* for July 1958, p. 1081.)

Special Report, by S. L. KUMAR. (See *Bulletin* for September 1958, p. 1446.)

Report (America [North and South],

DISCUSSION BY THE SECTION.

Meeting of the 2nd October 1958.

PRESIDENT : Dr. Ing. V. PERRONE.

— The meeting began at 9.30 a.m.

The President (in French). — Gentlemen, we will now examine Question 10, the second item on our agenda.

The reports on this question were prepared by Dr. STAGNI for the French speaking countries and Mr. KUMAR for the English speaking countries.

I will ask Mr. KUMAR, the *Special Reporter*, to be good enough to read the summaries of his special report which was published in the September *Bulletin*, and the Meeting will then examine these summaries.

Mr. KUMAR, the *Special Reporter*, then read the English text of these Summaries.

The President (in French). — Gentlemen, I do not think it is necessary to read the French text of these summaries, and if you are agreed, we will go straight on to examine each point of these Summaries separately. (*Agreed*). But first of all, do any of the Delegates present wish to make any comments of a general nature ?

Mr. Delacarte, *French National Railways* (in French). — There is one point which I have not seen mentioned regarding the small lines of the main line companies. In this report, mention is made of two things which are not forcibly connected with each other : on the one hand, there are real secondary systems, which are operated independently, and on the other hand, the secondary lines of the main line companies. I am only going to speak of these latter now. There is an idea which I have not seen retained, which is of great importance : and that is the fact that these lines are of considerable importance in bringing traffic to the main lines. This, in my opinion, justifies their retention. This is also true in the case of lines operated by small secondary systems, when the tracks have the same gauge. These lines are really important, as regards the traffic they bring to the main lines, for a much greater transport mileage than their own mileage. Apart from the S.N.C.F.

I am the manager of a small line which is only 7 km long but which carries 150 000 t of heavy freight, which then is transported hundreds of miles over the national system.

This is a point which might be introduced in Summary No. 3. Perhaps, we could return to it when discussing this Summary, but, I wanted to stress the importance of this item as regards keeping these secondary lines open.

The President (in French). — We will now hear Mr. SANTORO.

Mr. Santoro, *Italian State Railways* (in French). — Mr. PRESIDENT, it is indeed a fact that in this problem we first of all come up against a preliminary question, a critical point. Mr. DELACARTE stressed certain aspects of this, i.e. the definition of our name of « light railway. » I see that even the Reporters came up against this difficulty in their work. I think to start with we should avoid any definition, especially the extension of the classic term « light railway » to the secondary lines of the main line companies.

When examining the first Summary, we might return to this point. But I suggest avoiding any definition and introducing a foreword in which the problems dealt with under Question 10 will be defined, viz : the problems of true light railways, those of secondary railways, and finally those of the railways run by private enterprise (which may be moreover true secondary railways or even light railways). But I do not think we should upset all the Summaries and above all the Reports, which are excellent.

The President (in French). — I will now call on Mr. SANCHEZ.

Mr. Sanchez, Argentine State Railways (in Spanish). — On the basis of our experience in the Argentine, I must say that I am not in complete agreement with the text of Summary No. 1. i.e. on the essential question of the definition of a « light railway ». The Summary as now worded applies to all railways, whatever they are. All railways are endeavouring to obtain the lowest possible costs in connection with all the points mentioned. May I suggest the following new text : « A light railway is a railway with light traffic density which is built with the minimum capital investment compatible with an acceptable volume of working. »

The President (in French). — I call upon Mr. PARIBENI.

Mr. Paribeni, Federazione Nazionale Imprese Trasporti, Italy (in French). — I am the representative of the Federation of private railways of Italy. The general point which I wish to raise is the following one : we are extremely interested in the problem of operating such a category of railway. We hope that this problem will be dealt with again at the next Congress. I would like to mention that the International Public Transport Union, which has its headquarters in Brussels, and whose members are the operators of secondary railways and urban transport undertakings has already studied this problem, in particular at the Naples Congress in 1955 and the Hambourg Congress in 1957, and it will again be studied at Paris next summer. It would be desirable to have collaboration

between the work of these Congresses and those of the Railway Congresses dealing with similar problems. As far as the definition of light railways is concerned, that is a question which we are always up against.

Mr. Stagni, Reporter (in French). — I think that the question of discussing Summary No. 1 is a general one, which is why we can combine discussing the general aspects of the question with that of the definition to be used. The present discussion was preceded by a proposal to modify the text of Summary No. 1. I think that in the past the character of a railway depended above all on its constructional characteristics, which implied running it in a certain way. At the present time, it is the question of its operation which characterises the difference between light railways and ordinary railways. I think that a light railway can be distinguished from an ordinary railway by the lesser importance of its traffic, very often quite independently of its constructional characteristics. In my opinion, we might adopt the modification proposed by Mr. SANCHEZ which stresses in particular the importance of the distinction between traffic and operating.

Mr. Farquharson, East African Railways and Harbours. — There is just one point of a general nature that I should like to raise which has a bearing on this question. In this section we are called the Light Railways and Colonial Railways, but as you all know, the number of colonies has been greatly reduced and the word itself is out of favour for various reasons. I would suggest therefore that the attention

of the appropriate authorities be drawn to the desirability of describing this section simply as « Light Railways ». There is the further point that in the discussion of the last two days on the undulatory wear on rails, in effect all the conclusions reached were of general application, they were not of particular application to the problems of light railways. I agree with the view expressed by Mr. STAGNI that the definition should be a definition of the railway as such, whether it is colonial, metropolitan or any other location, and simply based on the functions of the railway and the volume of traffic which it carries.

Mr. Kumar. — The definition of the light railways caused considerable controversy when we met for finalising the questionnaire and later on when we met again for discussing the summaries. Now the original conception of the « light railways » was a railway where economy in construction was the main consideration and where it had to develop backward areas or inaccessible regions and move traffic to and from the collecting centres. This was the original connotation of the term light railways. Further, we should not forget that it was not only necessary to have the construction cost low, but that the cost of maintenance and operation must also be low.

In the twenties of this century, a historical event in so far as public transport is concerned took place. With the introduction of motor transport, traffic on certain railway lines declined rapidly, so that these railways began to show deficits and it was necessary to exercise the strictest economy both in their maintenance and

in their operation. These railway lines also joined the category of light railways built originally for the development of undeveloped areas. *The second* category is a category of small railways which were born with trimmings but had the frills cut out later on. So we have to include both these categories of light railways in our discussion.

The President (in French). — I now call upon Mr. UPMARK.

Mr. Upmark, Swedish State Railways, I think that the very title of « Light Railways and Colonial Railways » ought to be abolished as some other representatives have said. You can easily understand what was meant from the very beginning by light and colonial railways 50 or 60 years ago. But to-day the situation has changed. I would therefore suggest that we ask the Permanent Commission that the title of this section should be changed in the future. We cannot do it to-day — reports have been written under this heading « Light Railways and Colonial Railways ». I have discussed this matter at length with Mr. KUMAR earlier and to-day there is no possibility of getting any sense in this title. I believe that most of you agree with him that we have to change the title. For the future we should omit not only « Colonial » but even « Light » — I mean that what should be the sense of a section « Light » — this is the special problems of railways with low traffic. When you have low traffic you have always to economise in railways or we would always be in the red. But here there are quite special problems turning up with the railways with small

traffic. I should therefore suggest the title should be in the future — I have not made up my mind about it — but it may be something like « Special Problems of Railways with Low Traffic », or something similar. That was my first point.

The second point. I quite agree with the Argentine representative that we can change the first point in the summary in the direction which I have indicated, and which other representatives have indicated. I suggest « The light railway is a railway with a small traffic ». For such a railway, economisation — I mean investment and I mean operation cost and so on — economisation is of paramount importance. The abolishment of service is a close alternative — it is going very close. If traffic drops you have something more — you may have to abolish service entirely, the abolishment of service being a close alternative, at least in areas where other means of transport are available. I mean you must abolish service if you can use roads, but there are areas — I know some — where there are no other means of transport and that is why where other means of transport are not available there might be heavy roads and extremely low traffic.

I would suggest to say : « The light railways are railways with light traffic density, for which the economic aspect is of particular importance and where the abolishment of service is a very close alternative at least in areas where other means of transport are available ».

The President (in French). — Mr. PARIBENT's suggestion to get into touch with other associations dealing with this question will be submitted to the Permanent Commission.

Likewise the proposal to modify the name of Section 5 will also be submitted to the Permanent Commission.

But at the present time we are concerned with the text of Summary No. 1. Are there any other comments about this text ?

Mr. De Clercq, *Principal Secretary*, read the proposed text of Summary No. 1 :

1. A « light railway » (chemin de fer économique) is a railway for which economy, either from the point of view of construction, or maintenance or operating, is the main consideration.

Mr. Oquiénena, *Ministry of Public Works, Spain* (in French). — In the past, it was financial considerations which led, in view of the topographical difficulties, to the building of light railways (bed and track). These were the primordial considerations, but today it is the character of the traffic which must form the criterion for defining such railways. They are secondary rather than light or colonial railways. That is why I suggest the definition « secondary railways. »

Here I would like to raise a small point about the distinction Mr. KUMAR made from the point of view of operating costs. He said that a distinction should be made between maintenance costs and operating costs. I would be very much obliged if Mr. KUMAR would explain the difference. Here we group both costs together under the heading : « operating costs ». But, to return to my first remark, I suggest as title « secondary railways » adding if you like « regional ».

Mr. Santoro (in French). — Mr. PRESIDENT, I put forward a concrete proposal. I have already stated that in my

opinion we should delete any definition in the first Summary; we have not met together in order to define a light railway. A definition has nothing to do with the subject suggested as the theme of Question 10. Mr. STAGNI has said that the meaning of « light railway » has been extended so that it even includes the secondary lines of main line companies. I see that there is a lot of difficulty in defining the term « light railways ». I think we should suppress the definition. The important thing is to understand why starting with the idea of light railways, the subject has been extended until it includes the problem of secondary lines of main line companies.

In this case, the Summaries should be preceded by a foreword which simply states that in the present report both light railways properly speaking and the secondary systems of main line companies have been dealt with.

This problem has already been studied by the Congress; in particular I would recall the Rome Congress of 1950, and the Enlarged Meeting at Stockholm in 1952, whose programmes included an examination of railways with little traffic, i.e. « light railways ».

As I have just said, I suggest we abandon this question of giving a definition and word the summary in such a way as to define what it deals with.

The President (in French). — Mr. STAGNI, I think there is a risk of prolonging the discussions on Summary No. 1 unduly. I think nearly everyone is agreed that the word « colonial » be suppressed, that the word « light » no longer covers the present day problem, but that the expression « secondary » is more suitable,

and that it is above all the small amount of traffic, even within the main line railways, which characterizes Section V from the other Sections.

Mr. Stagni (in French). — Mr. PRESIDENT, do you not think it would be advisable to make a small Committee of the Delegates concerned, responsible for wording a text which will take into account all these discussions which will be put forward at our next meeting, naturally taking into account the results of today's meeting.

Mr. Lopez Abuin, *Ministry of Transport, Argentine* (in Spanish), after returning to much of the former discussion, added : I think that any question of the initial constructional cost is no longer of interest today, and should not be included in the definition. This should merely stress the fact that at any given moment all railways may find themselves forced to run on strictly economic lines, so that from one period to another they may stop being railways with sufficient traffic and become railways with light traffic only.

The President (in French). — I would point out that this question is dealt with in Summary No. 12.

Mr. Lopez Abuin. — I propose a dual regulation both for main line and for light railways and branch lines. So we could have the general regulations — the regulations for main lines according to traditional and orthodox railways' practice, and paralleling these main railways light regulations for the economic operation of secondary and light lines. This

is my proposition. I intend to keep the No. 1 summary and I even propose hearty congratulations to the reporter because I found it quite clear according to the present state of the question. In fact, I think what we need is a dual regulation and that is my proposition. Economic rules, and then the lines would be classified and reclassified according to the requirements of the traffic density, which may be changed according to seasonal peaks, etc. That is my proposition for a dual regulation for economic operations.

Mr. De Clercq (in French). — Mr. PRESIDENT, I think there is first of all a proposal to change the name of Section V. Secondly, since its name is to be changed, the new name must be defined. It is understood that the first proposal must first of all be submitted to the Permanent Commission. Why are we getting so heated about the second ?

The President (in French). — It is not yet certain that the modification will be accepted.

Mr. Broca, *Secretary* (in French). — Mr. LOPEZ ABUIN proposes to introduce the idea of the choice that is possible when the question arises of substituting the services. He suggests adding the following text : « and when it is considered necessary to draw up a more flexible operating regime for economic reasons and when it is necessary to relax the regulations for the economic operation of secondary lines. »

Mr. Lopez Abuin. — No, I mean the regulations must be simplified too because

you cannot operate on branch lines according to the requirements of main lines.

The President (in French). — We have therefore some clear proposals as regards Summary No. 1. What does the Special Reporter think ? I call upon Mr. KUMAR.

Mr. Kumar. — We have had now quite a long discussion on the definition of « light railways ». I would request the President to apply a closure to this general discussion. I will also request him to ask the delegates to speak in two languages, English and French, otherwise translation from Spanish to French and then to English takes more time. I know that some of the light railways are hanging between life and death and for their administrations this is a very important and vital subject. This explains why there is so much interest evinced by the people present here. The definition of the term « light railways » I am afraid, will not be so easy, as I have already said. My colleague Dr. STAGNI has said that we should have a sub-committee to formulate a definition, but my feeling is that if we had a sub-committee of a few of us, it is quite possible that the definition drawn up by the sub-committee might not be acceptable to a large majority of the delegates. The definition is now being hammered out, and we want one which might find a general acceptance. Another thing about a definition is that it should not be too long; therefore it is not possible that all aspects of a light railway can be brought into this definition. The definition has to be brief and yet comprehensive as far as possible.

Now a word about the distinction between maintenance costs and operating costs. This is easily understandable. Certain expenditure on the maintenance of track and of stock, even when you run a few trains only, has to be incurred. This is included in the term maintenance cost. And the operating cost is that for the running of trains, crew wages, cost of fuel, and so on. These aspects have been referred to in the summaries which follow and there will be an opportunity for discussing them in detail. I will now read out Summary No. 1.

The issue which has to be decided is whether there should be a definition of « light railways » in Summary 1 or whether it should merely be a preamble giving the scope of the subject of our discussion.

The President (in French). — It is not possible to suppress Summary No. 1.

I suggest that we discuss Mr. KUMAR's proposal which puts forward a slightly different text.

Mr. Kumar. — May I suggest that after hearing the discussion at this meeting I have another definition to propose which might perhaps satisfy most of the delegates. I will read it out : « A light railway is a railway with light traffic which for its financial stability must function with strict economy in its construction, maintenance and operation ».

Mr. Delacarte (in French). — I would like to put forward a proposal in order to simplify the discussions. Since just now,

it was suggested that a committee be formed to define the very purpose of our Section, this same committee should endeavour to define what we are talking about and as far as the discussions are concerned, we can leave this question for the time being and go on to Summary No. 2 saying : « the lines in question are the following lines... » This would avoid a discussion which would not satisfy anyone because everyone would want to add their own word. It would be best to go on and examine the next summaries straight away. The committee could discuss the definition.

The President (in French). — I would point out that our job to day is to formulate resolutions of a practical character. We will hear what three more Delegates have to say and then we can decide. I call upon Mr. PARIBENI.

Mr. Paribeni (in French). — I agree with Mr. DELACARTE. I would just like to ask the committee to take into account the desires of « railways of local interest » and not speak of light traffic, as such a characteristic is not found in every case. We often have a lot of traffic.

Mr. Sanchez (in Spanish). — I would like to recall the proposal I made just now for the text of Summary No. 1 « A light railway is a railway with little traffic built according to the criterion of minimum capital investment compatible with an acceptable operating volume. »

Mr. Upmark. — I would suggest a working party be set up among the members, that we get its report tomorrow

morning and then we proceed with Summary No. 2.

The President (in French). — We must first of all see if the Section agrees the summary. I think we should vote on the Summary suggested by the Special Reporter. Will you please read this Summary.

Mr. Broca (in French). — A « light railway » is a railway with little traffic which, for the sake of financial equilibrium, must observe strict economy from the point of view of construction, maintenance and operating. »

Mr. Kumar. — Now there are two aspects in it — light traffic and economy. It must have strict economy in operation for its very survival. Once we agree on the fundamentals we shall not disagree for long about wording the summary.

The President (in French). — We will take a vote. Will those Delegates in favour of the text please put up their hands.

— *The text is rejected by 24 votes against 18.*

The President (in French). — We will therefore form a Committee to prepare a new text which will be put before the next meeting. The Committee will consist of Messrs. KUMAR, as *Chairman*, and STAGNI, LOPEZ ABUIN, DELACARTE, OQUIÑENA and UPMARK, and it will meet at the end of the meeting.

We will now go on to Summary No. 2.

Mr. De Clercq (in French). — *Summary No. 2.*

2. From the point of view of the means to be adopted to reduce operating costs and to determine the resulting structural changes, the following categories may be distinguished :

- 1) the light railways in countries with rapidly developing economies;
- 2) the light railways in highly developed countries :
 - a) the small networks or isolated lines operated by private companies, generally under government control;
 - b) the secondary lines belonging to large national railways, which are State operated or controlled.

Mr. Kumar. — I propose that a slight modification to this clause be made — instead of having such a long preamble I would simply say : « The existing light railways can be divided into the following categories », because the light railways can be divided into these categories whether they adopt any improved methods of operation or not, or whether they rationalise their services or not.

Mr. Santoro (in French). — Mr. PRESIDENT, I would like to raise a point of economic terminology. A distinction is made here between countries according to the degree of economic development. First of all « countries with a rapid economic development. » and then « very developed countries. » This raises the question of measuring the rapidity of this development, so I want to ask the Reporter if he intended to refer to underdeveloped countries in the case of countries of the first category. I cannot decide whether Italy is a very developed country or a country that is developing very rapidly...

Mr. Kumar. — I have intentionally expressed the idea in that way. If we refer to certain countries as « under-developed countries » it might hurt their nationals. So I designated them as countries with rapidly developing economies. For the second point I personally consider that Italy is a highly-developed country.

Mr. Delacarte (in French). — To make it clearer, I think the Reporter might adopt the term « of recent economic development. » There are countries that developed a long time ago and countries which are sometimes called under-developed. But if they are under-developed, it is because they have not had since very long the chance to develop. I think we might call the former :

« countries whose economic development is of recent date. » They have only been developed for a short time. That would be better than saying : « countries with rapid economic development. »

Mr. Kumar. — Yes, that is all right; it is a phrase we shall accept though I do not like it as their conditions are not static. They are developing further; the process is still continuing. Instead of using the word « colonial » railways, I intentionally used these words. All these countries are now rapidly developing their economies. We shall not quibble about words, but recently developed means that they have now stopped developing, whereas when I said « rapidly developing economies » it means their economies are still developing.

Mr. Delacarte (in French). — We might say : « the other countries ».

Mr. Kumar. — That is all right. As long as we understand each other, we shall not quibble about words. So there are two main categories « Light railways in regions in under-developed countries. Light railways in other countries. » « Countries » may be replaced by the word « regions ».

Mr. Sanchez (in French). — Instead of « countries » might I also suggest saying « regions ». Moreover, there might be regions whose present economic state is static, but I think the modification suggested is not concerned with the evolution of the development. « Recent » instead of « rapid » ought to satisfy everyone.

Mr. Santoro (in French). — I think it is difficult to speak of recent or ancient development, and I think it would be better to say for the former countries : « undergoing development and in particular under-developed » (*Interruptions*) or else... « being developed » and « the others »...

Mr. Farquharson. — I would suggest that the sub-paragraph should be made « The light railways in *less* developed regions. » The fact is that they are less developed, but not static. The fact is that many of these countries do not have vast resources and whether we try to develop transport facilities in these countries must take account of this.

Mr. Kumar. — We may simply say « regions with developing economies ». This includes those that are growing slowly as well.

Mr. Oggier. — The phrase as it stands does not include the word « rapid » as it merely says « recently developed economies. »

Mr. Farquharson. — « Recent » is just as unsatisfactory as « rapid ».

Mr. Kumar. — I think that « rapid » may be removed and we should simply say « developing ». Take for example India — now I would say that we are now trying to develop all the transport systems and we are laying new railway lines, and therefore this is a case where the transport systems, both road and railways, are developing, whether slowly or rapidly. Therefore we should say simply « Light railways in regions with developing economies. »

Mr. Farquharson. — I still think recent is objectionable. We should remove « recent ».

Mr. Oquiñena (in French). — Perhaps, we could say that the light railways can be divided into two categories : 1) light railways in regions whose economic development is recent, and 2) light railways in other regions. Then *a*) and *b*) without change.

Mr. Garfield, *East African Railways and Harbours.* — May I suggest that the word « recently » may be omitted and we have just « developing economies ».

Mr. Kumar. — That is all right with me — « Light railways in regions with developing economies » — simply that.

As distinguished from them, I suggested originally the words « other regions of highly developed economies ». That was the original wording. The object was not to make insinuation that other countries were not developing or developed.

Mr. Stagni (in French). — I think the reason for this distinction is that there are countries where the level of development of road transport has not reached the proportions it has in others. That is why quite different problems arise in these two categories; I think that amongst all the solutions possible, it is now more accurate and less dangerous to say : « whose degree of economic development is more recent. »

Mr. Oquiñena (in French). — The proposal that is now under discussion is to see if we should give up the idea of the economics of the country as a whole and confine ourselves to the state of affairs obtaining in the transport industry of the country in question.

Mr. Broca (in French). — As regards the text, that is the idea. It is related to the transport requirements. It is a question of the railway, not of steel tonnage. Perhaps we could say « where transport requirements are expanding. »

Mr. Kumar. — I oppose that idea. This is because the position with regard to light railways such as in India is this, that as our economies develop, enough traffic is being generated so as to feed both the developing road and rail transport systems : so it is quite a distinct situation. The idea is that enough traffic for both

is available for a time without the need for a cut-throat competition.

Mr. Santoro (in French). — I would suggest substituting the expression « rapid expansion » for « development. »

Mr. Kumar. — I accept that without any hesitation as « developing » and « expanding » mean the same thing to me.

Mr. Santoro (in French). — Expansion has a much stronger meaning : every country is developing. I must point out that in India development or expansion is taking place much more rapidly than in our country, but all the same we are developing; we are not standing still.

Mr. Kumar. — I agree with that.

Mr. Lopez Abuin. — I suggest the expression be modified radically and say : « Light railways built to assist the economic development of regions. »

Mr. Kumar. — Well, there is no objection to that. Let us have any word as long as it expresses the idea. Will you read that wording again please ?

Mr. Lopez Abuin. — No, but in this case I would only say : « Light railways built to encourage regional development. »

Mr. Kumar. — Agreed.

Mr. Santoro (in French). — If we can come to an agreement, I have no objection.

Mr. Stagni (in French). — It is merely a question of expressing in the most suitable words, what we mean by coun-

tries with rapid development; we all know which these countries are, but we have not yet found exactly the right definition.

Mr. LOPEZ ABUIN's other suggestion changes the question a bit. I think that in the replies the Reporters received to the questionnaire, the difference between regions and countries was particularly remarked, because there are some countries where modernisation is well developed and all the railways which were built with different objects in view are faced with identical problems, while in other countries, the problems are quite different. In my opinion, I would suggest limiting the question, finding more appropriate terms and retain the substance of the meaning of the summary put forward by the Reporter, i.e. I think we should only modify the expression « rapid economic development » and say « more recent. »

Mr. Kumar. — I suggest that Dr. STAGNI's proposal that the original draft with slight modifications be put to vote. Let us stick to the original draft with the modifications : « Light railways in regions with more recently expanding economies ». I think the wording should simply say « Light railways in countries with expanding economies. »

Mr. Eydes, *East African Railways and Harbours.* — I would like to suggest that the original clause stands with one slight amendment to read : « The light railways in developing countries ». That is in conformity with the second paragraph which cannot be ignored. If you change the original No. 1 you also have to change No. 2.

Mr. Kumar. — That will be all right.

The President (in French). — Mr. STAGNI therefore suggests modifying the words « rapid economic » by « more recent ».

We will put Mr. STAGNI's proposal to the vote. I think we might read the text with the amendments proposed by Messrs. STAGNI and KUMAR.

Mr. Broca (in French). — « The light railways can be put into the following categories : 1) light railways belonging to regions whose economic development is recent; 2) the light railways of other regions.

The President (in French). — Does any one else wish to suggest any modifications to this text ?

Mr. Kumar. — My proposal was to keep the expressions « *highly* developed », and « light railways in regions with expanding economies ».

Mr. Oquiñena (in French). — So the light railways of the first category are the light railways of less developed regions ?

That might be a solution. The first, means very developed and the second less developed ?

The President (in French). — We might say « of other regions ».

Mr. TORRES, you wished to say something ?

Mr. Manitto Torres, *Portuguese Government* (in French). — I have followed the discussions very closely and I think that

there are some excellent points in all these opinions, but as we say in Portugal « the best is the enemy of the good » Under these conditions, I suggest that we simply say : in the case of 1) « light railways in countries of recent economic development. »

Mr. Kumar. — I suggest the following draft :

- (1) Light railways in regions with expanding economies;
- (2) Light railways in highly developed regions. These are further subdivided into :
 - (a) the small networks or isolated lines operated by private companies, generally under government control;
 - (b) the secondary lines belonging to large national railways, which are State operated or controlled.

Mr. Delacarte (in French). — Mr. STAGNI's last suggestion appears to be a very reasonable one. I would like it to be put to the vote.

Mr. Stagni (in French). — As far as I am concerned, it is all the same whether we put under 1), less developed or very developed countries. I would merely point out the term « countries » or the term « regions. » But I think we might leave the statement « very developed ».

In any country, there may be some regions that are more developed than others. We might retain the same form, but « regions » instead of « country » and « recent » instead of « rapid. » Do you agree about this ?

The President (in French). — Under these conditions, we will put it to the vote.

— *The Section by 38 votes to 4 agreed upon the following revised text :*

« 2. The light railways can be divided into the following categories :

« 1) The existing light railways in regions with recently developing economies.

« 2) The light railways in highly developed regions :

« (a) the small networks or isolated

lines operated by private companies, generally under government control.

« (b) the secondary lines belonging to large national railways, which are State operated or controlled. »

The President (in French). — Gentlemen, I will adjourn the Meeting so that the Wording Committee can have a chance to meet, and I will see you again at our next Meeting on Monday October 6.

— The meeting adjourned at midday.

Meeting of the 6th October 1958.

PRESIDENT : Dr. Ing. V. PERRONE.

— The meeting began at 9.30 a.m.

The President (in French). — Gentlemen, I declare the meeting open. This morning we have to complete our examination of the Summaries for Question 10 because tomorrow's meeting will be a very short one, and the Secretariat must have the necessary time to prepare the final wording of the Summaries which must be submitted for approval to the Plenary Session tomorrow morning at 11 a.m.

At our previous meeting, after a lengthy discussion, we decided to set up a Wording Committee responsible for the new text of Summary No. 1. This Committee consisted of Messrs. KUMAR, UPMARK, STAGNI, DELACARTE, OQUINENA and LOPEZ ABUIN.

The text of *Summary No. 1* suggested by this Committee is as follows :

« 1. The original concept of the term « light railways » has changed.

« The light railways studied here are lines which have problems different from those of main line systems on account of either the regional character of their traffic or the type of traffic requiring a simplified operation. »

— *This text is adopted.*

We still have 12 Summaries to examine. As we only have a very limited time, I must limit the number of comments to 5 at the most for each Summary, with three minutes speaking time for each one.

We will therefore go on to Summary No. 3. Will the Principal Secretary please read this Summary.

Mr. De Clercq (in French). — *Summary No. 3 :*

3. On the basis of the information supplied, the light railways constitute about 22 % of the total route mileage of the countries wherein they exist.

During the last two decades, there has been very little extension of light railways, a fact which may be attributed to the rapid development of the internal combustion engine in its application to road transport.

Mr. Poncet, French Light Railways (in French). — I have to make apologies for Mr. DELARCARTE who has been detained and cannot be present at this meeting. I discussed things with him, and he is fully in agreement with the comments I am going to make.

First of all, we think the figure of 22 % may seem too low to many delegates. I think we might be precise on this point and add that this figure relates to the length of lines, the traffic percentage being much lower than the percentage of length.

Mr. Kumar. — Yes, but the new definition has not changed the sense, the spirit or the meaning of the term « light railway ». It is only a restatement, therefore the figures do not have to be changed. They are based on the data supplied by administrations. I agree with the previous speaker that the figures are low. Most of the railways do not have separate statistics for light railways and those that actually do, may not have given them. Therefore, these figures are bound to be on the low side. But then there is no means of getting the correct figures now. That is why the wording: « on the basis of the information supplied ». We cannot help it if they did not give us the information.

Mr. Stagni (in French). — I would just like to say that from the replies received

from French speaking Railway Administrations, this percentage should be 38 %, whereas according to the replies received from the English speaking countries, the average was 22 %. For the time being, it is not possible to give more precise information.

Mr. Poncet (in French). — As I have stated the actual traffic of the secondary lines represents a percentage very much lower than that of their length because the traffic of a secondary line is always lower. But these lines are important because they bring long distance traffic to the main lines, which is the additional justification for keeping them open.

Mr. Kumar. — It is believed that the mileage of light railways as reported is rather on low side than actually it is.

Mr. Stagni (in French). — I think that this suggestion of Mr. PONCET's would be better in some other Summary, perhaps No. 6 or No. 9.

The President (in French). — What do you suggest.

Mr. Stagni (in French). — « According to the information received, the light railways represent about 22 % of the total lines in countries where there are such railways. It appears however that the real percentage is higher than this. »

The President (in French). — Do you agree to Mr. STAGNI's proposal ?

In the second paragraph, I suggest replacing « decade » which in French means ten days, by « decenie » or « last 20 years » and then instead of « this may

be attributed » I would say « which may be attributed essentially... »

Mr. Kumar. — Agreed.

— *The text adopted for Summary No. 3 is as follows :*

« 3. On the basis of the information supplied, the light railways constitute about 22 % of the total route mileage of the countries wherein they exist. It is thought, however, that the true percentage is higher.

« During the last two decades, there has been very little extension of light railways, a fact which may be mainly attributed to the rapid development of the internal combustion engine in its application to road transport. »

The President (in French). — We will go on to Summary No. 4.

Mr. De Clercq (in French). — *Summary No. 4 :*

4. Light railways of category 2 (a and b) have been reduced by 31 %. In the three categories as a whole, there has been about a 25 % reduction in the initial mileage, the substitute road services being operated by the light railways or their subsidiary companies, or by private firms, either on contract or not.

Mr. Kumar. — Here we face a difficulty now as we have reversed the order of the light railways in highly developed countries and light railways elsewhere. I would suggest that we may retain the original order, so that what became No. 2 the other day shall become No. 1 and No. 1 would become No. 2 again. Otherwise the order will not correspond with that followed in the special report. Is this agreed ? Then I propose no change in the numbering here.

I propose a slight change or modification to the wording of this clause. I suggest that we might divide it into two paragraphs : the first deals with the reduction in the mileage and the second with the « substitute » road services. So the new summary may read thus :

« Due to declining traffic some light railways in category 2 had to be closed down. They lost 31 % of their mileage during the last two decades. In the aggregate, the original route mileage of the two categories 1 and 2 was reduced by about 25 %.

« The second paragraph would read like this :

« The substitute services were provided by the road transport either run directly by the light railway companies themselves, by their subsidiaries or by private companies.

« These two paragraphs express two different aspects. It is desirable to indicate the reason for the closing of some light railways namely the declining traffic. If it is agreed we shall go on to the next summary.

The President (in French). — Are we all agreed about this revised text proposed by Mr. KUMAR ?

— *This text is adopted.*

Mr. De Clercq (in French). — *Summary No. 5 :*

5. As most of the light railways do not establish any statistics or did not supply sufficient operating data, it is not possible to formulate any general conclusions.

The President (in French). — I would prefer saying : « no complete statistics. »

Mr. Farquharson. — I just want to raise one minor point — it is not quite clear on what it has not been possible to formulate any general conclusions. Of course the main Question No. 10 is to consider methods of reducing operating costs, but to make the position quite clear I suggest we add the words at the end : « on the reduction of costs ».

Mr. Kumar. — I have suggested the addition of the expression « on their performance ». I propose the wording « any general conclusions on their performance ».

Mr. Farquharson. — But that is not the question...

Mr. Kumar. — It is the suggestion I have made. And also, instead of the word « establish » I would say « maintain » — a better English word to my mind. The French text may be all right. These are the two changes I propose, the first that we should say « maintain » instead of « establish » — « As some of the railway administrations do not *maintain* separate statistics » — and after « general conclusions » I want to add « regarding their performance ».

Mr. Garfield. — I would suggest that « cost » does not necessarily imply quite the same as « performance » — I agree it is more general.

Mr. Kumar. — We got some statistics of the volume of traffic but we wanted the statistics of costs — operating costs & receipts — some railways do not maintain such statistics separately. Therefore no

conclusions can be given regarding the performance which word means the overall picture of the working of the light railways.

Mr. Garfield. — I appreciate that, but in the title of the Question it speaks specifically of cost.

Mr. Kumar. — That comes later.

Mr. Sanchez (in French). — I would like to point out that it was extremely difficult to prepare any accounts of an economic order, especially in the case of secondary lines forming part of a main line system and in my opinion we should retain the original summary which mentions general conclusions.

Mr. Stagni (in French). — In the tables showing the receipts and expenditure given in my report, certain French speaking Railway Administrations gave their results, whilst others gave no information, in particular certain Administrations which found it impossible to do so.

I think it would be more accurate to follow Mr. KUMAR's idea, but to modify « operating balance sheet » by « operating results », as the operating results are the unit costs, the fixed costs, the varying costs, receipts, etc.

This can all be expressed in French by the word « operating results ». How would you say it in English ?

The President (in French). — Do you agree ?

Mr. Kumar. — That is agreed to.

Mr. Santoro (in French). — I think there is another point. First of all, Summary No. 5 speaks of « conclusions of a general nature ». Then Mr. STAGNI's proposal stresses the fact that statistical data are available.

Mr. Stagni (in French). — It would be better to put this with the general criteria, in Summary No. 9.

The President (in French). — I agree with Mr. STAGNI's proposal to leave the text as it is, changing the word « conclusions ».

If there are no other comments, we might modify this suggestion by saying : « conclusions of a general order as regards their results ».

— *The following final text was adopted :*

« 5. As some of the Railway Administrations do not maintain separate statistics for their light railways, and as many others who had, did not supply the required operating data, it is not possible to draw any broad conclusions regarding their performance. »

Mr. De Clercq (in French). — *Summary No. 6 :*

6. From the replies received, it appears that the following methods have been adopted to reduce the operating costs :

- a) introduction of some elements of mechanisation in laying and maintaining the permanent way;
- b) progressive abandonment of steam traction and its replacement by Diesel traction (150 to 450 HP railcars, 550 to 850 HP locomotives) and, in certain cases, by electric traction;
- c) simplification of the signalling and operating methods;

- d) doing away with the traditional subdivision of the staff into different departments (employees available for multiple duties);
- e) having the traction units driven by one man (one man cars);
- f) progressive replacement of lines remaining unprofitable despite the application of various methods of rationalisation, by road services, run as part of the railway undertaking;
- g) simplification and perfecting of the transport documents.

Mr. Kumar. — In this case I propose a very minor change, that instead of the phrase « to reduce the operating costs » in the third line we should say « to improve the financial position », because this item 6(a) dealing with the introduction of some elements of mechanisation in laying and maintaining the permanent way, is not an operating cost, it is a cost of the maintenance of the track. Once this distinction is appreciated, the reason for the amendment becomes obvious.

Mr. Poncet (in French). — At the end of f) I would like to add after : « within the undertaking itself », « or under contract with a road firm ». This is the method used by the S.N.C.F. which makes contracts with road undertakings to assure the replacement services.

Mr. Kumar. — Yes, that is all right.

Mr. Stagni (in French). — I would suggest changing the order of points f) and g), i.e. putting at the end the « progressive replacement of lines which remain unprofitable despite the introduction of various methods of rationalisation by road services ».

As for the substitute methods they will

be taken up in point 9, which deals more particularly with this question, I will suggest a slight alteration when we discuss this.

Mr. Kumar. — Yes, that is all right.

Mr. Oquiñena (in French). — In my opinion, that is all right, but I heard **Mr. KUMAR** say that he had suggested a modification inspired by his idea that the permanent way costs are not operating costs. This raises a very important question.

The cost of maintaining the permanent way is considered by us to be an operating cost; if one follows the distinction **Mr. KUMAR** makes between operating costs and maintenance costs, agreement must be reached about the accountancy methods to be used. Each Administration can prepare its accounts as it pleases. Here in Spain, we include the cost of maintaining the permanent way in the operating costs.

Mr. Kumar. — In India and in some other countries, I know the maintenance costs of the track are not considered operating costs. In some other countries they may be included in the operating costs. Therefore I proposed the amendment to the wording.

Mr. Paribeni (in French). — I am in agreement with **Mr. STAGNI**'s proposal to change points *f*) and *g*) around, and I would also suggest including in the last paragraph before point *f*) the following : « simplification and improving exchanges of rolling stock and various services between linked up companies. » This is

a method much practised in Switzerland and one which is to be introduced in Italy; we are in the course of obtaining the right conditions.

Mr. Kumar. — The interchange of rolling stock between adjacent railways has been a practice even before the competition from road traffic became significant. So it is not an item specifically for reducing the operating costs.

Mr. Paribeni (in French). — As regards the maintenance services, it may be advantageous to have machines to maintain the permanent way mechanically, machines which are bought by a group of undertakings. Such services are considered of great importance in Italy and I find that a great deal has been done in this respect in Switzerland.

Mr. Kumar. — Such means have been adopted in all those countries where the labour is very expensive. One way of reducing the cost is to reduce the labour force required through mechanisation. That is why this method was adopted specifically to reduce the labour costs. With regard to the second point, exchange of wagons between one system and another has been an accepted practice between any two systems that work in coordination. It can by no means be regarded as a special feature for reducing the operating cost of light railways.

The President (in French). — I see no objection to adding **Mr. PARIBENI**'s suggestion.

Mr. Kumar. — There is another point : none of the railways mentioned this

exchange of wagons between systems as a method of reducing costs. I have no objection to including it but I am only pointing out that this aspect was not mentioned by any railway in its reply to the questionnaire.

Mr. Williams, Malayan Railway Administration. — I suggest that paragraph (b) should be very much simplified, and I suggest it is wrong to stipulate the horsepower of the traction. For instance, we have chosen diesel-electric locomotives of 1 500 HP. So I would suggest that we omit the horsepower and say «and its replacement by diesel, diesel-electric or electric traction», and leave it like that. I think it should mention diesel-electric which we have.

Mr. Kumar. — The point raised is that « diesel-electric » be added — that gives a form of transmission as distinguished from the hydraulic or mechanical transmission. I have no objection to the inclusion of the diesel-electric. Mr. WILLIAMS may please say whether the diesel traction he referred to was used on a light railway or on a main line? The horsepower of the diesel engine need not be mentioned.

Mr. Farquharson. — Might I suggest, Mr. PRESIDENT, that we deal with the question section by section and try to reach finality on each section. The question is becoming very complicated with various amendments to each section.

Mr. Kumar. — We might now adopt it as proposed.

Mr. Stagni (in French). — Mr. PRESIDENT, I do not agree about adding : « diesel-electric » for a special reason, because in Section 2, we discussed the system and agreed there should be freedom of choice between mechanical and electric traction. Here, therefore, we are going against what was decided in Section 2.

The President (in French). — I think we can bring the matter to an end. The first paragraph suggested by Mr. KUMAR will therefore read : « From the information received, it appears that the following methods have been adopted with the object of improving the financial position of light railways. » Then we would add Mr. PARIBENI's suggestion : « exchange of rolling stock and various services between linked up companies. »

Mr. Farquharson. — A very small point on (d) — this appears an opportunity to discuss it — « doing away with the traditional sub-division of the staff into different departments (employees available for multiple duties) ». Mr. STAGNI deals with this point very clearly in his report, the aim is to get the permanent and continuous use of employees. I think it should be added to make the point quite clear : « to make sure, as far as practicable, of the continuous use of employees ».

Mr. Kumar. — That is the same idea.

The President (in French). — We will read the text as it results from these discussions.

Mr. Broca (in French). — *Summary No. 6.*

« 6. From the information supplied it appears that the following methods have been adopted for improving the financial position of the light railways :

« *a*) introduction of some elements of mechanisation in laying and maintaining the permanent way;

« *b*) progressive abandonment of steam traction and its replacement by diesel traction and in certain cases by electric traction;

« *c*) simplification of the signalling and operating methods;

« *d*) doing away with the traditional subdivision of the staff into different departments (employees available for multiple duties) to ensure as far as practicable the continuous employment of personnel;

« *e*) having traction units driven by one man (one-man cars);

« *f*) simplification of the exchange of rolling stock and services between contiguous railways.

« *g*) simplification and perfecting of transport documents;

« *h*) progressive replacement of lines remaining unprofitable despite the application of various methods of rationalisation by road services. »

Mr. Oquiñena (in French). — I would suggest an alteration to paragraph *c*) : « simplification of the signalling and operating methods. » As an example I would mention the closing down of stations which may need a modification in the legislation. I would suggest including in the modification the commercial methods as well as the technical.

Mr. Kumar. — In such cases, we can say : « simplification of the technical, operating and commercial methods. » Most countries distinguish between operating methods and commercial methods.

— *The final text adopted is worded as follows :*

« 6. From replies received, it appears that the following methods have been adopted to improve the financial position of the light railways :

« *(a)* the introduction of some elements of mechanization in laying and maintaining the permanent way;

« *(b)* progressive abandonment of steam traction and its replacement by Diesel traction and, in certain cases, by electric traction;

« *(c)* simplification of technical, commercial and operating methods;

« *(d)* doing away with the traditional subdivision of the staff into different departments (employees available for multiple duties), to ensure as far as practicable the continuous employment of personnel;

« *(e)* having traction units driven by one man (one-man cars);

« *(f)* exchange of rolling stock and various services between adjoining railways;

« *(g)* simplification and perfecting of the transport documents;

« *(h)* progressive replacement of lines remaining unprofitable despite the application of various methods of rationalisation by road services. »

Mr. De Clercq (in French). — *Summary No. 7 :*

7. The dividing line between electrification

and dieselisation is a matter to be decided by each undertaking. However, on the whole, it can be stated that the general tendency is towards dieselisation.

Electrification appears to be reserved for mountain lines, connections with systems that are already electrified, and for countries where the price of fuel is high.

Mr. Kumar. — I have suggested another amendment to this clause. In English we do not « decide » a dividing line between two items of preference, we always draw one. I have suggested the word « choice » instead of « dividing line ». So I would suggest the wording be changed like this : « The choice between dieselisation and electrification will vary with local conditions on each undertaking. In general, a preference appears to be towards dieselisation ». No change, except « appears to be » instead of the word « is ». And in the second paragraph I suggest the word « suitable » instead of « reserved ».

Mr. Sanchez (in French). — In the second paragraph, I suggest replacing the word « country » by « regions ».

Mr. Kumar. — Yes, that is right — agreed.

Mr. Paribeni (in French). — I suggest we suppress the last part of the sentence in the second paragraph. I think that to make the choice of the method of traction depend on the cost of fuel is a question which may be only of temporary value. We have to decide upon things that will go on and we are on the threshold of something new.

The President (in French). — We do not know what is going to happen in times to come.

Mr. Kumar. — I suppose that the idea is that we should leave out the words at the end. At least some railways say that they adopted electrification because the price of fuel is high. Naturally, the decision was taken at the time when the line was constructed, for the relative cost conditions may change, but then you can't easily change the type of traction over it. I have no objection, but I am only giving the background why this information was included. But if the delegates think that this may be deleted, I would agree. There is however no doubt that if the general price of oil fuel is high, then naturally electrification would be preferred.

Mr. Stagni (in French). — When my opinion was asked, I remembered how I had read in the replies that in different countries the question of the choice of fuel was a very important matter. And it is probable that it will always be the price of fuel which will be the deciding factor in the choice between electrification and dieselisation.

In my opinion we should keep « the cost of fuel ».

Mr. Paribeni (in French). — I would like to insist upon the following point : Electrification is decided upon as a function of the operating costs and the cost of the installations. The heavy cost of the installations is justified when the cost of buying the stock is high. But we have found that the cost of these machines is falling very much and therefore on secondary railways where the powers are not very high and where the purchase price of electric rolling stock is about the same as the cost of similar diesel or even diesel-electric rolling stock, the electric

traction loses one of its reasons of economic interest. I think that today, in every country, electric traction will have very little chance.

There is also another aspect of the question :

The electric railways have nothing to do with the business of producing electricity, because they need a great deal of power and the user is always very poor.. I think that electric traction is looked on with very little favour, especially by the small railways.

Mr. Ytasse, *Compagnie Générale d'Exploitations Ferroviaires et Routières, France* (in French). — The second paragraph should be retained. We could meet Mr. PARIBENI by adding « under present conditions » or « from the technical point of view. » In this way everyone would be satisfied.

Mr. Kumar. — Agreed.

Mr. Williams. — I suggest we might get over this difficulty by leaving out « fuel » and saying just « in those regions where the price of electricity is comparatively low ».

Mr. Kumar. — Yes — we can say where the electric supply is comparatively cheap.

Mr. Williams. — Leave out the fuel completely. The important point is the electricity cheaply available — comparatively cheap.

Mr. Kumar. — Yes, we should leave out the reference to the fuel cost and have only : « where electricity is comparatively cheap ».

Mr. Stagni (in French). — No, I would prefer to say : « where the cost of electricity is the most favourable. »

Mr. Kumar. — Yes. Yes, that is all right. Now one can read the whole summary.

Mr. Ytasse (in French). — I think the text was rightly worded. We must include something to satisfy Mr. PARIBENI, for example : in countries where the price of fuel is very high. »

The President (in French). — I would agree with this suggestion.

Mr. Paribeni (in French). — So would I. I would prefer to retain this form and add it to the original text.

Mr. Farquharson. — Why not « relatively high » ?

Mr. Stagni (in French). — I suggest saying : in regions where the price of fuel is particularly high ».

The President (in French). — I must remind you, Gentlemen, that at the beginning of this meeting I called your attention to the fact that we must complete all the discussions on the Summaries today, as tomorrow's meeting will be a very short one and moreover the Secretariat must have sufficient time to formulate the final texts to put before the Plenary Meeting. We will therefore read the final text of Summary No. 7.

Mr. Broca (in French). — « 7. The choice between dieselisation and electrification will vary with the local conditions.

There is, in general, a preference for dieselisation.

« Electrification appears to be suitable for mountain lines, connections with systems that are already electrified and for regions where the price of fuel is particularly high. »

— *Adopted.*

Mr. De Clercq (in French). — *Summary No. 8 :*

8. The financial rehabilitation of the light railways would be considerably facilitated if they enjoyed greater liberty and more flexible tariffs, as is the case in general with independent road transport services.

In certain cases, the light railways could meet competition by participating in the road services. On the other hand, the independent road transport firms should be obliged to adhere strictly to the road traffic and labour regulations and more effective fiscal and administrative control should be introduced, in order to make their respective positions equivalent and consequently equitable.

Mr. Tuja, *International Railway Union* (in French). — Mr. PRESIDENT, I would like to make a suggestion. It seems to me that in the summaries one point of view is lacking, which might perhaps be included in paragraph 8 or 9, which is the following one : « in certain countries the continued operation by private companies of part of the secondary lines is justified by the experience such a company has acquired in operating it and by the special facilities it may have. » I think this is an idea that is lacking in the summaries.

Mr. Stagni (in French). — I think it is very important.

Mr. Tuja (in French). — Mr. PRESIDENT, I would like to know if the Meeting would agree to introducing this idea, and perhaps the best place would be after point 12.

Mr. Hoens, *Vice-President* (in French). — I would be in favour of including it in Summary No. 11. As regards Summary No. 8, I would like to modify the sentence : « ... establish fiscal and administrative control » by adding the word « technical ».

Mr. Kumar. — Yes, technical, fiscal and administrative controls, that is right.

Mr. Farquharson. — My point is that the definition is not strong enough. We all know that there is wholesale evasion by road operators of regulations, and I would suggest that « strictly » in the phrase « to adhere strictly to the road traffic regulations » should be « absolutely », and when it says « and more effective control » it should be « fully effective control » — fully effective and enforced.

Mr. Kumar. — I have suggested for the second paragraph « Some light railways *can* counter the road transport competition by participating in the road transport themselves. » And the second part — « To place the railways in a position of parity and equity with the road transport services it is necessary to impose and enforce certain operating, fiscal and administrative controls on the road services. » And the word should be plural — controls, not control.

Mr. Oggier. — Mr. KUMAR's draft has been put finally as an amendment to the

published one. It would consist of the first paragraph standing as it is, but with the second paragraph amended to read : « Some light railways can counter road transport competition by participating in the road transport themselves. To place the railways in a position of parity and equity with the road transport services it is necessary to impose and enforce certain technical, fiscal and administrative controls on the latter. »

Mr. Kumar. — What of the first paragraph — is that to be modified ?

Mr. Oggier. — The first paragraph need not be changed.

Mr. Kumar. — Actually, I have suggested it, but do not press it — I do not insist on its acceptance.

Mr. Williams. — It should be « introduced and enforced ».

Mr. Kumar. — We can now go on to Summary No. 9.

The President (in French). — No other comments ? Will you please read the French text.

Mr. Broca (in French). — *Summary No. 8 :*

« 8. The financial rehabilitation of the light railways would be considerably facilitated if they enjoyed greater liberty and more flexible tariffs, as is the case in general with independent road transport services.

« Some light railways can counter the road transport competition by participating in the road transport themselves.

« To place the railways in a position of parity and equity with the road transport services, it is necessary to impose and enforce certain technical, fiscal and administrative controls on the latter. »

The President (in French). — Summary No. 8 is therefore *adopted*.

Mr. De Clercq (in French). — *Summary No. 9 :*

9. If the efforts made by the light railways to improve their position have proved fruitless, a programme to replace the lines showing the greatest deficit by road services can be considered, which may eventually make up for part of the losses on the lines kept open. A mixed solution can be considered in which motor transport would replace the railway services during slack hours, so that the line can be closed down for part of the day (stations, signalling, etc.).

In certain cases, partial cancellation of the services can be considered (doing away with the passenger or freight services).

The President (in French). — I want to cross out that part of the sentence which reads « which may make up eventually for part of the losses on the lines kept open. » The scope of this sentence is very limited, as the large railways have no chance of making good the losses on secondary lines by the profits from road services. But the real reason for keeping the secondary lines open, is to keep control of the services, give guarantees and above all assure that the rates will be the same. That is why I suggest limiting the sentence. It is not necessary to explain the reason.

Mr. Farquharson. — I support that proposal.

Mr. Kumar. — Yes, that is all right.

Mr. Poncet (in French). — I would like to make certain modifications to Summary No. 9, in order to take into account the comments made by the Delegates and in particular those of Mr. DELACARTE regarding the better coordination of all the systems. The replacement of railway services, dealt with under point *h*) of Summary No. 6 must be kept in mind when the above measures are exhausted or found to be insufficient, but it is possible to judge a priori their effects, before they have been introduced. It is rather difficult to give any criteria for such a judgement, but it is always necessary to take into account in the evolution of the statistical data and economics not only the actual traffic on the line to be closed, but also the long distance traffic the line brings to the main line system.

Mr. Stagni (in French). — I suggest modifying the second paragraph as follows : « In certain cases partial closing down (suppressing the passenger or the freight services) might be considered, or the abandoning of certain sections in the centre of lines which could be replaced by road services. Replacement road services can be operated by the undertaking itself or under contract by private undertakings. »

« In all cases, every care must be taken that traffic continuing over the rest of the system is safeguarded, in order to obtain an improvement in the financial situation of the railway. »

Mr. Oquiñena (in French). — I want to ask you if it is possible to take into account in transport contracts with railway systems of its affiliated companies.

The President (in French). — We have already said this.

Mr. Sanchez (in French). — We mentioned affiliated companies in Summary No. 4.

Mr. Oquiñena (in French). — It would be opportune to introduce this point here as well, as our railways assure certain road services through subsidiary companies.

Mr. Kumar. — My point is that the only new idea which Dr. STAGNI has introduced in his draft is the criterion about the abandonment of a railway line, namely that the traffic should not be considered only on the light railway itself but also the traffic exchanged between it and the main line system. Well, that point can be brought in the existing draft without making a completely new draft.

Mr. Stagni (in French). — A combined solution is also possible. There is no difficulty about it.

Mr. Kumar. — I would suggest the adoption of this draft : « In cases where efforts at economic rehabilitation of light railways proved fruitless, then a programme of progressive replacements of the lines showing the greatest deficits should be considered. The criterion for such abandonment should be based not only on the traffic on the light railway itself but on that which it receives from or feeds into the other lines also. In some cases, only partial replacement of the services would be necessary, the road transport being used to provide substitute services

during periods of slack traffic enabling the closing down of the railway operation (station working and signalling) at such times or cancellation of certain passenger or goods train services. » This is the idea which is given in the existing summary — I have only introduced the idea that the criterion should also take into account the traffic which feeds into or receives from the main lines. I suppose that was Dr. STAGNI's main point.

Mr. Sanchez (in French). — I prefer Mr. STAGNI's text which is clearer.

Mr. Stagni (in French). — I suggest combining both texts into one. It is a question of the wording. It is necessary to include the ideas that have been added.

Mr. Upmark. — When the Special Reporter has agreed to a change, why should we then change it once more ? Why don't we take the Special Reporter's text ? I would suggest that we take Mr. KUMAR's draft with the change which was introduced just now.

Mr. Williams. — I suggest that as everybody appears to be in agreement with what should go into the text, Mr. KUMAR and Mr. STAGNI should prepare a suitable draft.

Mr. Qquiñena (in French). — In the case of the second paragraph, I suggest saying : « In certain cases, partial closing down of the working may be considered, as well as closing down or down-grading certain stations. »

In Mr. STAGNI's text it is merely a question of lines which link up with the

rest of the system at both ends, but it is also necessary to take into account stations near the junction station. If we add : « closing down or down-grading stations. » it would be clearer.

Mr. Stagni (in French). — The text would read : « In certain cases, there might be a partial closing down of the railway services (closing or down-grading certain stations, suppression of the passenger or freight services), or abandoning certain intermediate sections where the services can be maintained at both ends.

« A mixed solution can be considered in which motor transport will replace railway services during the slack periods, thus enabling the line to be closed down for part of the day (stations, signalling, etc.) »

Mr. Oquiñena (in French). — In Spain, there are some stations which are only 4 or 5 km apart; but at present there are motor services in nearly all the small villages, and it would be possible to close one or two stations. It depends on the traffic. In this way it is possible to economise on staff.

Mr. Stagni (in French). — These remarks will be taken into account when the final text is drawn up.

The President (in French). — Messrs. KUMAR, STAGNI, and LOPEZ ABUIN will meet at the end of the meeting to draw up the final text of this Summary. We will adopt this Summary they are going to prepare together, and now we will go on to Summary No. 10.

— *The text of Summary No. 9 drawn up after the meeting by this Committee is as follows :*

« 9. If the efforts made by the light railways to improve their position have proved fruitless or are considered insufficient, the lines showing the greatest deficits may be abandoned.

« It is not possible to give general criteria for the abandonment of these lines. It is necessary, however, to take into account, when evaluating the statistical and economic data, not only the traffic on the line but also the longer distance traffic which a line brings to the main railway network. In some cases, it is possible to allow a partial cancellation of services (closure or demolition of certain stations, abolition of passenger or freight services), or by abandoning intermediate lengths of certain lines where the service can be provided at the ends.

« A mixed solution can be considered in which motor transport would replace the railway services during slack hours, so that the line can be closed down for part of the day (stations, signalling, etc.).

« The substitute road services may be operated by the Railway Administration itself, by subsidiary companies or else by a private company under contract.

« In all cases, traffic extending over the rest of the network must be safeguarded in order to improve its financial position.

« In the case of abandonment, common agreement should be established between the railways, road and post office departments, with the consent of the local authorities, to enable the railway facilities (road beds, stations, lines of communication) to be used by the respective departments. »

Mr. De Clercq (in French). — *Summary No. 10 :*

10. If all these combined efforts do not result in a satisfactory solution to the problem of financial stability; but if for political, strategic, topographical or climatic conditions, the line has to be kept open, it is up to the Government or other authorities concerned to take the necessary steps.

Mr. Broca (in French). — **Mr. KUMAR** has suggested this new wording for this Summary :

« 10. If all effort at financial reconstruction have failed, and in spite of everything, a line has to be kept open for political, strategic, geographical or climatic reasons, it is for the Government or Public Authorities concerned to take the necessary steps to remedy the situation by paying a given subsidy. »

Mr. KUMAR has added the idea of a given subsidy, and in the French text I have replaced « topographical » by « geographical. »

The President (in French). — Personally, I find it difficult to agree to **Mr. KUMAR**'s proposal; I think the last few words might be omitted, as there are many other means by which the Government can improve the economic position of an undertaking. We will say : « to take effective measures to remedy the situation. » Do you agree ?

Mr. Broca (in French). — They need not necessarily be subsidies; it might be a change in the taxes, and in this case, it is no longer a subsidy.

The President (in French). — Agreed.

— *The text adopted reads as follows :*

« 10. Should all efforts at financial rehabilitation fail and yet a railway line is required to be retained for political, strategic, geographical or climatic reasons, the Government or other public authorities concerned should take effective measures to remedy the situation. »

Mr. De Clercq (in French). — *Summary No. 11 :*

11. The grouping together of all the light railways of a country is a matter deserving consideration, so long as this is compatible with greater flexibility and greater freedom of action as regards the simplification of operating measures, and the rationalisation of the services and tariffs.

Mr. Hoens (in French). — As far as simplification of operating measures is concerned, the rationalisation of the services and the tariffs, the proposed amalgamation must be such as to reduce the overall costs, in particular by doing away with duplication.

Mr. Paribeni (in French). — I agree with the VICE-PRESIDENT's suggestion. We should not speak about all the railways of a country but of the railways with similar characteristics.

The President (in French). — « The amalgamation of the light railways of each region. »

Mr. Hoens (in French). — **Mr. PRESIDENT**, it is a question of amalgamation, which means in fact in this case doing away with duplication.

The President (in French). — Duplication in connection with what ?

Mr. Hoens (in French). — For example, in connection with the administrative services.

The President (in French). — Then let us say so : « simplification of the administration », but duplication seems to mean from the context that there are two parallel lines.

Mr. Stagni (in French). — It would be simpler to say : « The amalgamation of light railways is worth considering, in order to obtain a reduction in the general costs and better user of the fixed installations and rolling stock, and in so far as... »

Mr. Poncet (in French). — We should also add : « light railways which do not belong to the main line companies. »

Mr. Stagni (in French). — The question is not so clear cut, as the advisability of amalgamating the private lines and light lines of the State system might be considered. This has been considered in Italy between certain private lines and certain lines of the State Railways to obtain a better amalgamation.

I will repeat the text : « Amalgamation of the light railways is worth considering, in order to obtain a reduction in the general costs and better user of the fixed installations and rolling stock, in so far as this is compatible with greater flexibility and greater freedom of action as regards the simplification of operating measures and the rationalisation of the services and tariffs. »

The remarks about the private lines might be included in this paragraph.

Mr. Kumar. — The expression « so long as it assures » would be preferable to « so long as it is compatible with ».

Mr. Sanchez (in French). — I am wondering whether this Summary does not contradict to some extent Mr. TUJA's proposal which I think wished to safeguard private initiative and above all the actual individuality of the secondary railways. On the one hand, amalgamation and on the other, the wish to maintain the railways as they are now. I think there would be a certain trouble here. Mr. TUJA's proposal should be read.

Mr. Poncet (in French). — The amalgamation of lines depending of secondary railways is in no way incompatible with the linking up to the main line companies of their secondary lines.

Mr. Broca (in French). — I will reread Mr. TUJA's proposal, which might be added to the end of this Summary. It is as follows : « In certain countries, the administration of part of the secondary lines by private companies is justified because of their experience in running these lines and the special facilities they may have. »

Mr. Kumar. — Private enterprise in the management of light railways has been justified by experience and should be encouraged. I suppose that was the idea. « Private enterprise in the government of light railways has proved useful by experience and should be encouraged. »

Mr. Oggier. — But more by the special facilities they could have.

Mr. Kumar. — It does not read well yet. Will the proposer please explain to me his idea, and I will redraft it in English.

Mr. Oggier. — He is not here.

Mr. Kumar. — Well then, we can delete it.

Mr. Broca (in French). — Mr. KUMAR suggests it be suppressed.

Mr. Stagni (in French). — I do not think Mr. TUJA is referring to the political aspect of « private » management, i.e. there is no question of deciding whether the railways are the property of the State or privately owned. But the private form should be safeguarded in the case of railways where it has given the best results.

Mr. Kumar. — That is right. Therefore we should delete only that phrase. Organisation of management of light railways should be such as to afford greater flexibility and greater freedom as regards the relationship between the client and the railway itself. It is not to say that private enterprise is better than the nationalised managements — I agree with Dr. STAGNI that that was not the idea. A management should enjoy full freedom in deciding on tariffs and for the simplification of its relations with its clients.

Mr. Sanchez (in Spanish). — In my opinion, the present wording satisfies everyone, no matter what regime is in force in the different countries concerned.

Mr. Poncet (in French). — Mr. TUJA's proposal might be adopted. It does not

aim at contrasting State and private lines. It is merely a question of competence, and to settle any doubts we might say : « in certain countries retaining the running of part of the lines with little traffic by secondary companies finds its justification... etc. » without mentioning private companies.

Mr. Kumar. — We are not here to introduce the idea or make a positive recommendation that the management should be private — that would not be desirable. We only want to achieve for the administration of a light railway flexibility in dealing with a client and in moving his goods. We are not considering here the subject of national management versus « private enterprise ».

Mr. Ytasse (in French). — I am in complete agreement with Mr. TUJA's proposal. I think we might add the words « in this connection » after the second sentence, to link it up with Mr. KUMAR's proposal.

Mr. Paribeni (in French). — I would like to retain Mr. TUJA's proposal with the modifications recommended.

I think it might be possible make Summary No. 12 the second part of Summary No. 11, because Summary No. 12 deals with a particular case of the amalgamation of secondary railways within the national network, from the technical point of view of the operating.

Mr. Broca (in French). — This is how the text of Summary No. 11 will read :

« 11. The grouping together of light railways is a matter deserving consider-

ation, so as to obtain a reduction of general costs and a better utilisation of fixed installations and rolling stock, so long as this is compatible with greater flexibility and greater freedom of action as regards the simplification of operating measures, and the rationalisation of the services and tariffs. »

« In certain countries retaining the running of part of the secondary lines by private undertakings is justified because of the experience such companies have acquired and because of the special facilities they have at their disposal. »

The President (in French). — Do you agree to the first paragraph ? (*Agreed*). I will put the second paragraph to the vote.

Mr. De Clercq (in French). — I think it was said during the discussions that the paragraph about the private companies would not be retained.

Mr. Stagni (in French). — I want this proposal to be abandoned and to have it referred to the next Congress, where the problem will certainly be brought up, or by the U.I.T.

The President (in French). — This is a question of a political character and I propose it be voted upon. It is not the amalgamated light railways which it is question of handing over to private enterprise but the secondary lines of the main line companies. We cannot say both « amalgamated » and « left to private enterprise. » I wish to stress this before we vote, as it is a very important matter.

Mr. Stagni (in French). — I am of the same opinion as the President.

Mr. Oquiñena (in French). — I also agree with Mr. STAGNI. It would be better to delete this phrase.

The President (in French). — We will put to the vote whether the second paragraph is to be retained. Will those Delegates in favour of the second paragraph please raise their hands.

— *The result of the voting was 14 votes for and 21 votes against retaining this text.*

The President (in French). — The adjunction is not accepted.

— *The text adopted for Summary No. 11 is :*

« 11. The grouping together of light railways is a matter deserving consideration, so as to obtain a reduction of general costs and a better utilisation of fixed installations and rolling stock, so long as this is compatible with greater flexibility and greater freedom of action as regards the simplification of operating measures, and the rationalisation of the services and tariffs. »

Mr. De Clercq (in French). — *Summary No. 12 :*

12. In the case of certain national systems, the advisability of separating, within the system itself, the light railway lines from the main lines, as regards the regulations operating and accounts, is under consideration.

The President (in French). — Is the Meeting agreed about Summary No. 12 ?

— *Adopted without discussion.*

Mr. De Clercq (in French). — *Summary No. 13 :*

13. The standards which can be applied in order to obtain satisfactory and efficient rail-road co-ordination depend upon those factors forming the advantages road transport possesses over the light railways: door to door services, greater flexibility, simplification of relations with clients, reduction to the minimum of indirect and general costs, lower capital investments.

The technical measures and organisation measures which may be considered in the case of rail-road co-ordination involve the intervention of the main line railway.

In addition, the Government must intervene effectively in order to avoid competition against the lines finally maintained in service.

Mr. Santoro (in French). — I do not think it serves any useful point to make this lengthy enumeration of the advantages of road transport. We could be shorter, more to the point.

Mr. Kumar. — I have proposed a modified draft of Summary No. 13 which I should like to be read out both in French and English.

Mr. Broca (in French). — Here is the new text proposed by Mr. KUMAR :

« 13. (a) In order to improve the economic conditions, the light railways should emulate the road transport system by providing facilities such as door to door services, greater flexibility and simplification of relations with the clients and by reducing to a minimum the indirect and general costs and the capital investments.

« (b) It is necessary for the national or central government to intervene to achieve effectively rail-road co-ordination.

Particularly it is their duty to protect from harmful road competition, those lines which have to be retained in operation.»

Mr. Kumar. — This Summary contains two main ideas and it should be thus divided into two parts. One is with regard to the idea dealing with the action which should be taken by the railway administration itself for improving the financial position of the light railways. The second idea refers to the duty of the central government to achieve rail/road co-ordination and to prevent harmful road competition from affecting adversely the railway interests.

The President (in French). — Do you agree with Mr. KUMAR's proposal ?

Mr. Stagni (in French). — It is necessary for the Government to protect all the lines which are kept open whether they are main lines or secondary lines. It is the duty of the Government to protect them and to decide whether they should not be closed. I suggest deleting in paragraph *b*) the word « *main* ». But I would point out that this is not used in the English text. It is therefore a mistake in the translation. We are therefore agreed.

— *The above mentioned text was adopted and the French translation duly corrected.*

Mr. De Clercq (in French). — *Summary No. 14 :*

14. In order to improve the returns from the capital available for the transport industry, the following principles should govern any investments :

- a) to develop in extent and improve in quality the inland road network, in order to absorb the traffic (passenger and freight) from the secondary lines to be closed down, rather than make important great and long motor arteries for heavy motor transport, parallel to the main lines of the main railways;
- b) to orientate motor construction and road traffic standards towards limiting the dimensions and loads of road vehicles, so as to avoid the development of large capacity motor vehicles and trailers, whose presence upon the roads is the cause of the inadequacy of the road network and involves capital expenditure upon new roads to a far greater extent than would be needed for private vehicles and vehicles of average tonnage.

Such measures are within the competence of the Governments.

Mr. Farquharson. — Can we have Mr. KUMAR's proposed summary ?

Mr. Kumar. — « To improve the return from the capital available for developing the transport industry (rail or road system), the following policies in regard to the investment of the capital are recommended for adoption :

« (a) Roads over which the substitute road services run in place of the railway services cancelled wholly or partially, should be improved. But no capital should be invested in constructing new roads or widening and strengthening existing ones which run parallel to the railway lines the functions of which the road transport system cannot effectively replace.

« (b) Government should prevent by legislation or otherwise investment of capital in construction of heavy road vehicles for transport of goods as such introduction would make the existing roads designed for lighter vehicles inadequate.

quate. The strengthening or widening of both of such roads would require a heavy outlay.

« The above measures are within the competence of the national or central government concerned. »

The President (in French). — Are you agreed about this new wording ?

Mr. Farquharson. — I think the revised draft is a great improvement, but I do think we must hammer home to the railways their own responsibilities, which are very great. I would like to add that railway administrations must do all in their power to retain or get back traffic which can make a contribution to the net revenue of the undertaking.

Mr. Kumar. — But that has already been done in the previous Summary, No. 13.

Mr. Farquharson. — That has been done to a certain extent in a previous clause, in the redrafting of No. 13, but it is an important point which has been brought out very clearly in Mr. STAGNI's report. The emphasis must be placed on the railways' own responsibilities.

Mr. Kumar. — Yes, I agree that great emphasis has been put on this in Dr. STAGNI's report.

Mr. Lopez Abuin. — We propose in order to face the programme of branch closing of light railways which have lost, the preparation of organic plans for progressive substitution of railways by roads by a common agreement by which

the road bed, the road bridges and what we call fixed installations may be handed to the highest bidder. The station buildings and even lines should have gone to the Post Office and then the rolling stock and track material which would be recoverable should be redistributed among the other lines. That means the substitution of the present policy of branch closing and track lifting, leaving the local position, which would be substituted by an organic plan made in agreement with the highways administration and local communities. This I think is an important matter and when I spoke in Spanish I expressed a concrete case. If you don't oppose it we should propose to make a third proposition under letter (c).

Mr. Stagni (in French). — I think one might make a comment of a general nature about this proposal : « If a railway line is closed down the existing installations can be used to make roads, but only according to agreement or a definite plan established with full agreement between the railway administration and the road and public authorities. » This remark could however be added to Summary No. 9 which deals with replacement services.

Mr. President, Mr. LOPEZ ABUIN and myself could be responsible for presenting a text to the meeting tomorrow morning.

The President (in French). — No, we must finish now. The Summary must be adopted today.

Mr. Stagni (in French). — I am not entirely in agreement. Mr. KUMAR's new text diverges somewhat from the original

text. Here it says : « no capital should be invested in the construction of new roads. » I said that motor roads should not be constructed for heavy traffic, but it is impossible to avoid making motor roads for the ordinary traffic. This is the character of every new motor road. It is impossible to stop the road network from being improved.

We stated that the presence of heavy tonnages was the reason why the road network is insufficient and for its wear. This is quite a different thing. We cannot say that the existing roads are designed for light vehicles or heavy traffic. They cannot be suppressed; they are in existence. Our task is to make sure that the dimensions of vehicles are not increased, which is a tendency in some countries.

Mr. Kumar. — It's all very nice to say that we are not opposed to the provision of arterial roads, but once constructed it will be difficult for any Government to prevent heavy vehicles running over them. Heavy traffic, where available, would go over all roads.

Mr. Lopez Abuin. — I am going to support Mr. KUMAR's version. I am sorry to be against your proposition. We are a railwaymen's congress. I am not talking as a Minister of Transport of my country but as a railwayman on this occasion. We must keep to the railway position and not make political decisions more or less favourable to other men, but must be drastic from our own position which has a very solid background. So I think it has to be kept in the same wording as preventing the construction or building of roads in any case of light railways. I

think we as a railway in congress should keep it in force as it has been set up by Mr. KUMAR.

Mr. Oquiñena. — I agree with Mr. LOPEZ ABUIN. I will quote an example. In Switzerland, alongside many of the small mountain railways there is also a road, and it was a question of improving either the railway or the road. A contract was concluded between the Swiss Government and the Railway Administration. The latter improved its railway and the Swiss Government has not improved the road for more than 30 years. That is why I rather agree with Mr. KUMAR's idea on the last text and with Mr. LOPEZ ABUIN's idea for the second question and the tonnage of heavy weights. We are also representatives of Railway Administrations; there is no justification, it should be prohibited.

Mr. Stagni (in French). — I agree, but I am merely saying that the first wording was preferable.

The President (in French). — We have to propose something of a general character, we cannot go into details.

Mr. Oquiñena (in French). — Perhaps, you did not understand what I meant. It was to support it. I wish to say now that it is not impossible to retain Mr. KUMAR's proposal. Everything possible should be done to prevent new roads being constructed parallel to the railway lines, as well as the construction of large lorries.

Mr. Stagni (in French). — In the first text, it said that short distance local

traffic should be encouraged rather than long distance heavy traffic. The road network should be improved rather than long arteries constructed for heavy motor traffic parallel to the main lines. It is a question of the capital investment in new arteries.

The President (in French). — Under these conditions, I want to know if you agree about the original text proposed by the Special Reporter which was published in the Bulletin of the Association ?

You are now proposing to discuss point *a*). We must not go back to point *a*).

Mr. Kumar. — Now the question is do we want new roads to be constructed parallel to railways ?

The President (in French). — I will put point *a*) to the vote. Are the Delegates agreed about point *a*) ?

Mr. Stagni (in French). — I wanted to avoid having to put it to the vote. We might say : « the roads on which the replacement services run should be improved, but great prudence should be exercised in constructing new roads for heavy traffic alongside the railway whose functions cannot be effectively replaced by road transport. »

— *After being put to the vote, paragraph a) was adopted.*

Mr. Lopez Abuin. — Mr. STAGNI, if you agree to point *a*), if everyone is agreed

about *a*) as given in the Bulletin, I will not say anything else. The only difference between Mr. KUMAR and myself is the question of the enlarging and strengthening of what already exists. We are assisting at a Railway Congress.

Mr. Kumar. — Now please tell us in English what is the text which is under consideration. Read it out with all amendments in it.

Mr. Broca (in French). — There will be no modification. It remains as it is. After the vote, the recent discussion was about a comment made by Mr. STAGNI on paragraph *a*) after it had been agreed by vote. There is nothing new.

Mr. Kumar. — I withdraw my amendment and clause (*b*) as it is printed may be approved.

— *The original text of Summary No. 14 was adopted without modification by a large majority after being put to the vote.*

The President (in French). — Gentlemen, this brings us to the end of our work. It is my great pleasure to thank above all the Reporters for their complex and perspicacious work, the whole Meeting for the attention with which the discussions have been followed and the Secretariat for its extremely opportune, intelligent and dynamic collaboration.

— The meeting rose at 12.45 p.m.

DISCUSSION AT THE PLENARY SESSION.

Meeting of the 7th October 1958.

PRESIDENT : Sr. D. AGUSTÍN PLANA.

GENERAL SECRETARIES : Messrs. P. GHILAIN and J. PÉREZ POZUELO.

Mr. Ghilain, General Secretary (in French). — We now come to Question 10, the Summaries for which as adopted in Section were published in Nos. 4 and 6 of the *Daily Journal of the Congress*.

— *The reading of these Summaries did not give rise to any comment except in the case of point 11 (French text), where at the request of a Delegate it was decided to use the plural : « Amalgamations of light railways... » instead of « The amalgamation... »*

The President (in French). — Apart from this modification, we can therefore consider the Summaries for Question 10 as ratified.

SUMMARIES.

« 1. The original concept of the term « light railways » has changed.

« The light railways studied here are « lines which have problems different « from those of main line systems on account of either the regional character « of their traffic or the type of traffic « requiring a simplified operation.

« 2. The light railways can be divided « into the following categories :

« 1) The existing light railways in « regions with recently developing economies.

« 2) The light railways in highly developed regions :

« (a) the small networks or isolated « lines operated by private companies, « generally under government control.

« (b) the secondary lines belonging « to large national railways, which are « State operated or controlled.

« 3. On the basis of the information « supplied, the light railways constitute « about 22 % of the total route mileage « of the countries wherein they exist. It « is thought, however, that the true percentage is higher.

« During the last two decades, there « has been very little extension of light « railways, a fact which may be mainly « attributed to the rapid development of « the internal combustion engine in its « application to road transport.

« 4. Due to the declining traffic, « some light railways in category 2 had « to be closed down. They lost 31 % « of their mileage during the last two « decades. In the aggregate, the original

« route mileage of the two categories 1
« and 2 was reduced by about 25 %.

« The substitute services were provided by the road transport either run
« directly by the light railway companies
« themselves, by their subsidiaries or by
« private enterprise.

« 5. As some of the Railway Administrations do not maintain separate
« statistics for their light railways, and
« as many others who had, did not supply the required operating data, it is
« not possible to draw any broad conclusions regarding their performance.

« 6. From replies received, it appears
« that the following methods have been
« adopted to improve the financial position of the light railways :

« (a) the introduction of some elements of mechanization in laying and
« maintaining the permanent way;

« (b) progressive abandonment of
« steam traction and its replacement by
« Diesel traction and, in certain cases,
« by electric traction;

« (c) simplification of technical, commercial and operating methods;

« (d) doing away with the traditional
« subdivision of the staff into different
« departments (employees available for
« multiple duties), to ensure as far as
« practicable the continuous employment
« of personnel;

« (e) having traction units driven by
« one man (one-man cars);

« (f) exchange of rolling stock and
« various services between adjoining
« railways;

« g) simplification and perfecting of
« the transport documents;

« (h) progressive replacement of lines
« remaining unprofitable despite the
« application of various methods of
« rationalisation by road services.

« 7. The choice between dieselisation
« and electrification will vary with the
« local conditions. There is, in general,
« a preference for dieselisation.

« Electrification appears to be suitable for mountain lines, connections
« with systems that are already electrified and for regions where the price
« of fuel is particularly high.

« 8. The financial rehabilitation of
« the light railways would be considerably facilitated if they enjoyed greater
« liberty and more flexible tariffs, as is
« the case in general with independent
« road transport services.

« Some light railways can counter the
« road transport competition by participating in the road transport themselves.

« To place the railways in a position
« of parity and equity with the road
« transport services, it is necessary to
« impose and enforce certain technical,
« fiscal and administrative controls on
« the latter.

« 9. If the efforts made by the light
« railways to improve their position have
« proved fruitless or are considered insufficient, the lines showing the
« greatest deficits may be abandoned.

« It is not possible to give general criteria for the abandonment of these

« lines. It is necessary, however, to
« take into account, when evaluating the
« statistical and economic data, not only
« the traffic on the line but also the
« longer distance traffic which a line
« brings to the main railway network.
« In some cases, it is possible to allow
« a partial cancellation of services (clo-
« sure or demolition of certain stations,
« abolition of passenger or freight servi-
« ces), or by abandoning intermediate
« lengths of certain lines where the ser-
« vice can be provided at the ends.

« A mixed solution can be considered
« in which motor transport would re-
« place the railway services during slack
« hours, so that the line can be closed
« down for part of the day (stations,
« signalling, etc.).

« The substitute road services may be
« operated by the Railway Administra-
« tion itself, by subsidiary companies or
« else by a private company under
« contract.

« In all cases, traffic extending over
« the rest of the network must be safe-
« guarded in order to improve its finan-
« cial position.

« In the case of abandonment, com-
« mon agreement should be established
« between the railways, road and post
« office departments, with the consent
« of the local authorities, to enable the
« railway facilities (road beds, stations,
« lines of communication) to be used by
« the respective departments.

« 10. Should all efforts at financial
« rehabilitation fail and yet a railway
« line is required to be retained for
« political, strategic, geographical or cli-

« matic reasons, the Government or
« other public authorities concerned
« should take effective measures to
« remedy the situation.

« 11. The grouping together of light
« railways is a matter deserving consi-
« deration, so as to obtain a reduction
« of general costs and a better utilis-
« ation of fixed installations and rolling
« stock, so long as this is compatible
« with greater flexibility and greater
« freedom of action as regards the sim-
« plification of operating measures, and
« the rationalisation of the services and
« tariffs.

« 12. On some national railway sys-
« tems the advisability of separating
« within the system itself, the light rail-
« way lines from the main lines as
« regards the regulations, operating and
« accounts, is under consideration.

« 13. (a) In order to improve the eco-
« nomic conditions, the light railways
« should emulate the road transport sys-
« tem by providing facilities such as
« door to door services, greater flexibility
« and simplification of relations with the
« clients and by reducing to a minimum
« the indirect and general costs and the
« capital investments.

« (b) It is necessary for the national
« or central governments to intervene to
« achieve effectively rail-road co-ordi-
« nation. Particularly it is their duty
« to protect from harmful road compe-
« tition, those lines which have to be
« retained in operation.

« 14. In order to improve the returns

« from the capital available for the
« transport industry, the following prin-
« ciples should govern any investments :

« (a) to develop in extent and im-
« prove in quality the inland road net-
« work, in order to absorb the traffic
« (passenger and freight) from the se-
« condary lines to be closed down,
« rather than make important great and
« long motor arteries for heavy motor
« transport, parallel to the main lines of
« the main railways;

« (b) to orientate motor construc-

« tion and road traffic standards towards
« limiting the dimensions and loads of
« road vehicles, so as to avoid the
« development of large capacity motor
« vehicles and trailers, whose presence
« upon the roads is the cause of the in-
« adequacy of the road network and
« involves capital expenditure upon new
« roads to a far greater extent than
« would be needed for private vehicles
« and vehicles of average tonnage.

« Such measures are within the com-
« petence of the Governments. »

OBITUARY.

RAUL DA COSTA COUVREUR,

Former President of the Higher Council of Public Works of the Ministry of Public Works and Communications of Portugal.
Honorary Member of the Permanent Commission of the International Railway Congress Association.



We have learnt with great regret of the death on the 24th June last, at the age of 79 years, of M. RAUL DA COSTA COUVREUR, former President of the Higher Council of Public Works of the Ministry of Public

Works and Communications of Portugal and Honorary Member of the Permanent Commission of the International Railway Congress Association.

After extremely successful studies at the former « Escola do Exercito », which in 1902 awarded him his Civil and Mining Engineer Diploma, MR. DA COSTA COUVREUR began his long career by entering almost immediately the Administration of the State Railways (South and South-East Region). He held several posts therein in succession, amongst them those of Research Engineer, Head of the Constructions Department, Assistant to the Chief of the Way and Works Department, and finally was appointed Deputy Director. He left this last post in 1921 to enter the General Administration of Posts and Telegraphs, where he was appointed Head of the Civil Engineering Department. Invited to join the teaching staff of the Lisbon Industrial Institute, he was first of all Assistant, then Professor of the topography, roads and railways courses.

However, his interest in railway matters led him to return in 1926 as Chief Engineer of the Way and Works Department of the General Management of the Railways to the Ministry of Public Works and Communication, a post which he held for four years.

He was then promoted Inspecting Engineer of Public Works and entered the

Higher Council of Public Works, where he presided over several Sections in turn, and finally was appointed President of the Higher Council of Public Works, a post which he filled with brilliance until his retirement in 1949, always retaining the greatest interest in any work in connection with the railways.

His prestige and competence led to Mr. DA COSTA COUVREUR taking part in many organisations both at home and abroad; amongst other things, he was Chairman of the Supervisory Commission of topographical and urban surveys, of the Engineers Association, of the Association of Archeologists and the Numismatic Commission, of the Portuguese Section of the French Civil Engineers, member of the « Nacional Junta de Educaçao », correspondent of the Portuguese Academy of History, correspondent of the Madrid Royal Academy of History and of the Royal Academy of Arts of Cordova.

His public activities were the subject of numerous commendations and citations and he was awarded amongst others the following decorations: « Grand-Croix du Christ », « Officier de l'Ordre de Saint-Jacques », « Commandeur de l'Ordre de l'Instruction Publique and Chevalier de la Légion d'Honneur ».

Mr. DA COSTA COUVREUR was appointed Member of the Permanent Commission of the International Railway Congress Asso-

ciation in 1930. He was always a faithful friend to our Association and in spite of his many responsibilities, he made a point of always attending regularly the annual meetings of the Permanent Commission, where he gained the sympathy of all his colleagues by his friendly character and gifted personality.

He took part in the London (1925), Madrid (1930), Cairo (1933) and Paris (1937) Sessions as delegate of the Ministry of Commerce and Communications of Portugal as well as the Enlarged Meetings of the Permanent Commission in Brussels in 1935 and 1939.

He was delegate for the Ministry of Public Works and Communications at the Congress of Lucerne (1947) and Congress of Rome (1950) at which he acted as Vice-President of Section III: Working.

He took an important part in the Enlarged Meeting at Lisbon in 1949, where he agreed to act as President of the Local Organisation Committee, and he also took part in the Enlarged Meetings at Stockholm (1952) and The Hague (1956). He also took part in the recent Congress at Madrid (1958).

After his retirement in 1949, he was unanimously appointed an Honorary Member of the Permanent Commission.

We offer his family our sincerest condolences.

The Executive Committee.

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[016. 385 (02)]

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(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress jointly with the Office Bibliographique International, of Brussels, (See « Bibliographical Decimal Classification as applied to Railway Science », by L. WEISSENBRUCH, in the number for November 1897, of the *Bulletin of the International Railway Congress*, p. 1509).

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[016. 385 (02)]

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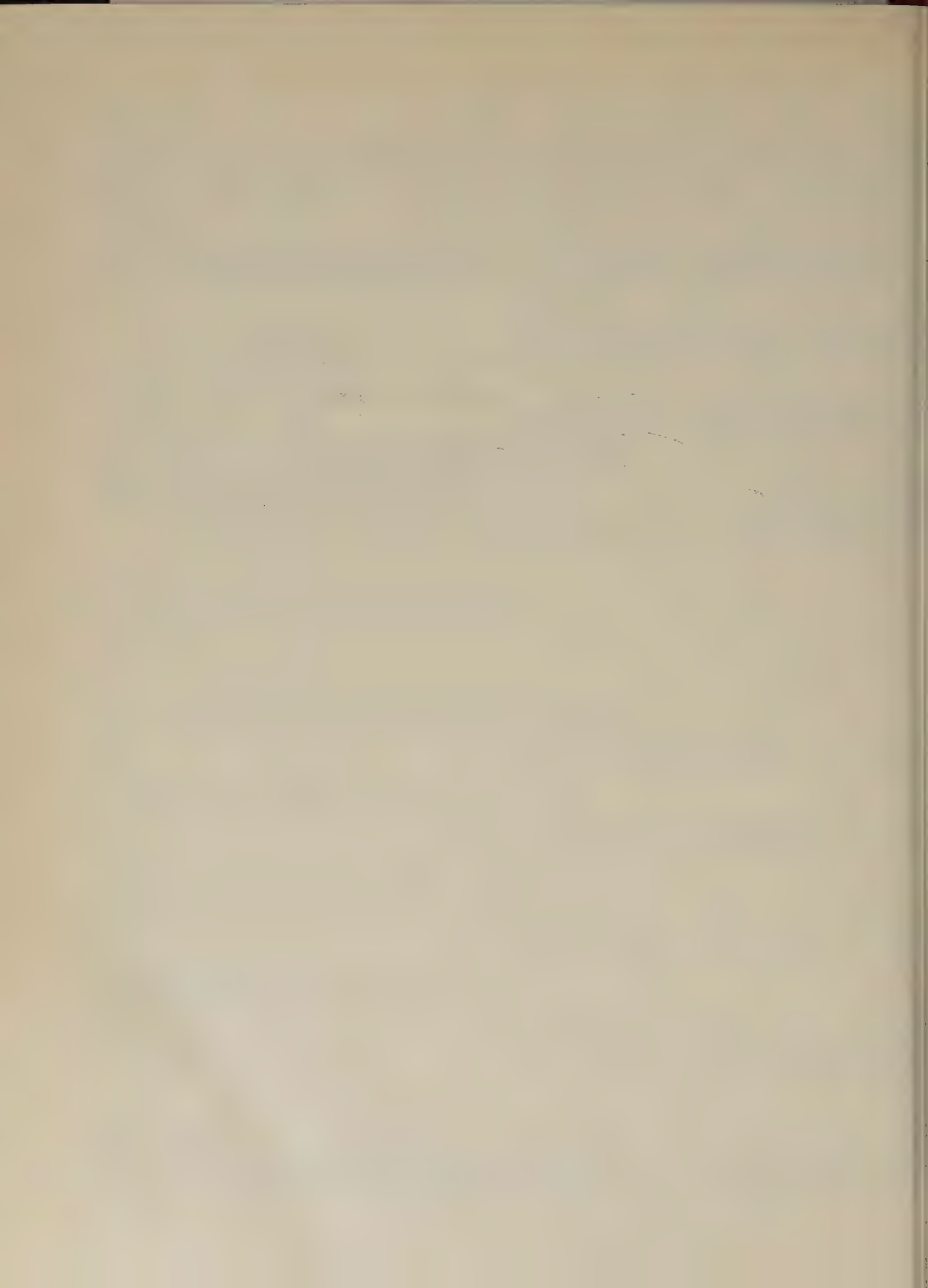
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MONTHLY BIBLIOGRAPHY OF RAILWAYS⁽¹⁾

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[016. 385 (02)]

I. — BOOKS.

In French.

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Paris, édité par la Direction Générale de la S.N.C.F.,
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[016. 385 (05)]

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